

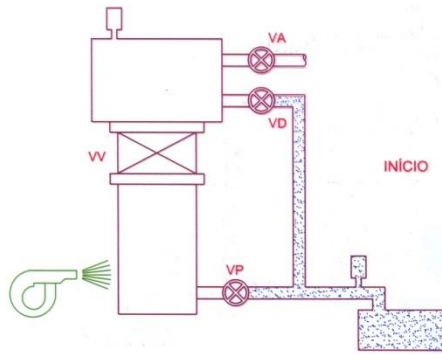
**4º CURSO DE TECNOLOGIA DO VÁCUO
PARA INDÚSTRIA E LABORATÓRIOS**

BOMBAS DE VÁCUO - 2

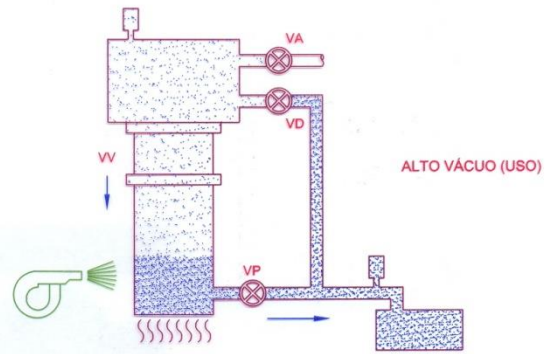
20 - setembro - 2016

UNIVERSIDADE DE SÃO PAULO - INSTITUTO DE FÍSICA

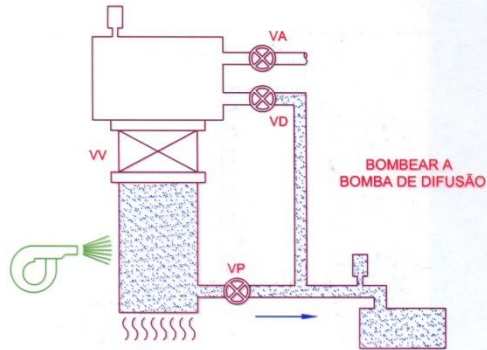




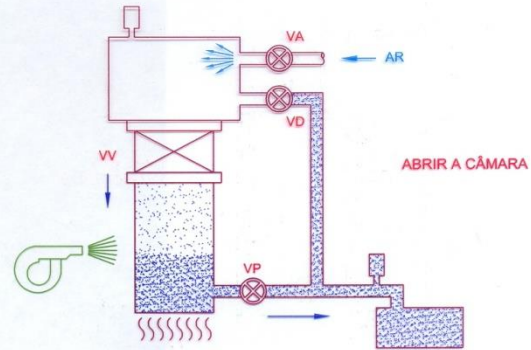
1. TODAS AS VÁLVULAS FECHADAS
2. LIGAR BOMBA MECÂNICA
3. VERIFICAR PRESSÃO



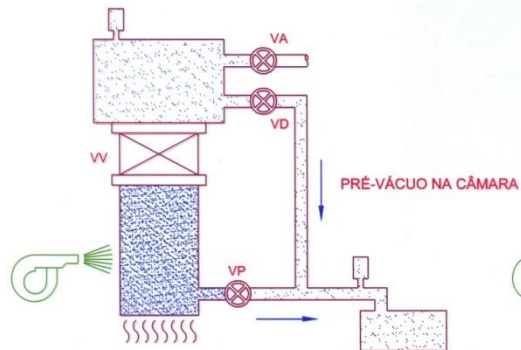
1. FECHAR VD
2. ABRIR VP
3. ABRIR WW



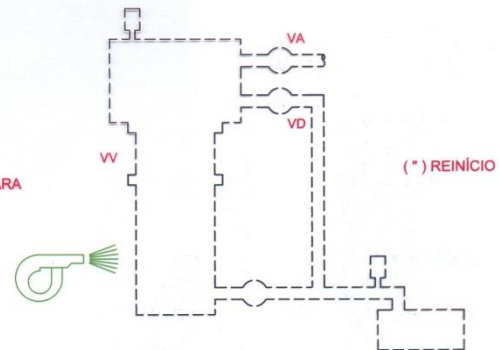
1. ABRIR VÁLVULA VP
2. PRÉ-VÁCUO NA BOMBA DE DIFUSÃO
3. LIGAR AQUECIMENTO
4. LIGAR VENTILADOR / ÁGUA DE REFRIGERAÇÃO



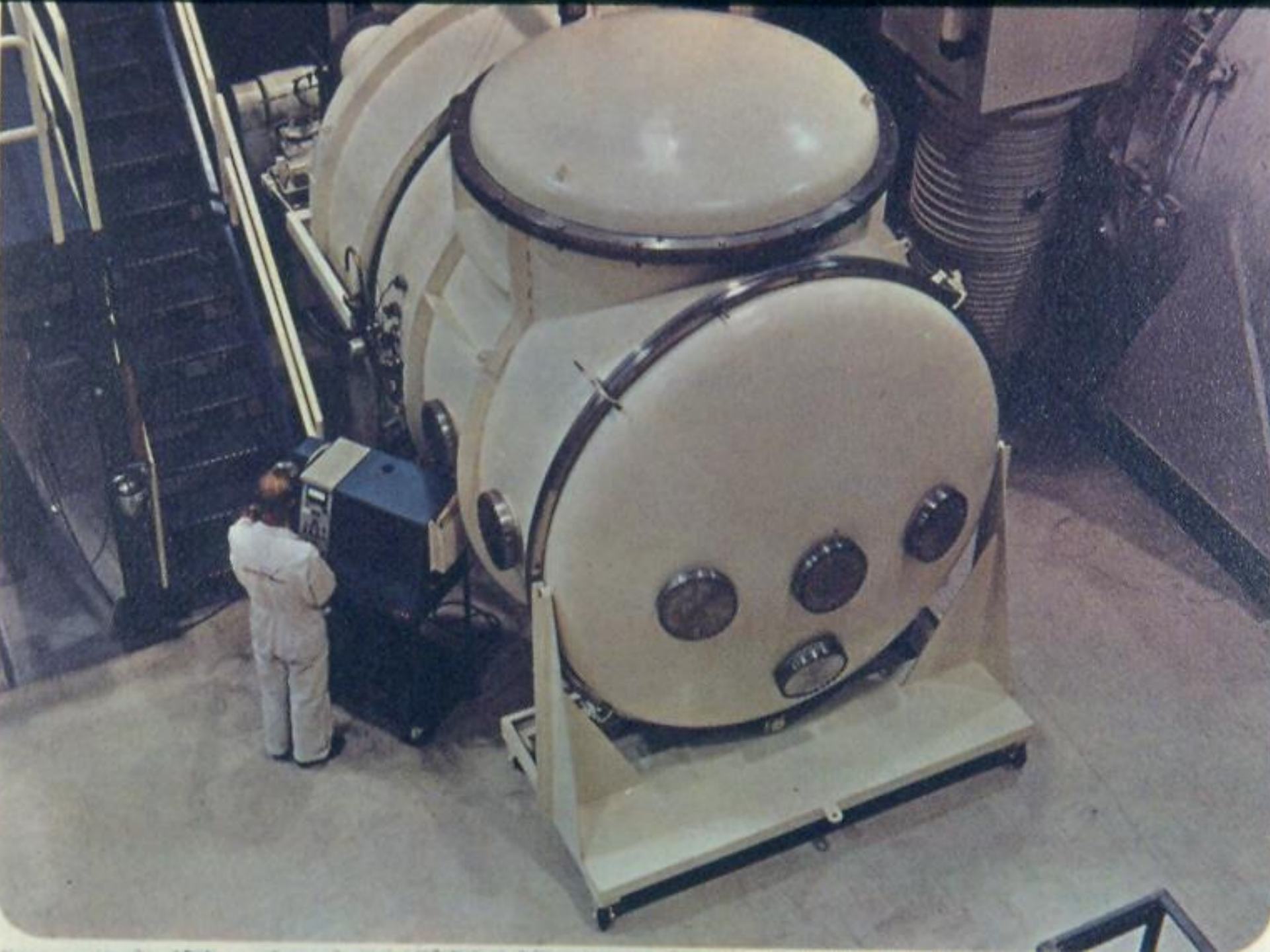
1. FECHAR WW
2. ABRIR VA PARA AREJAR A CÂMARA



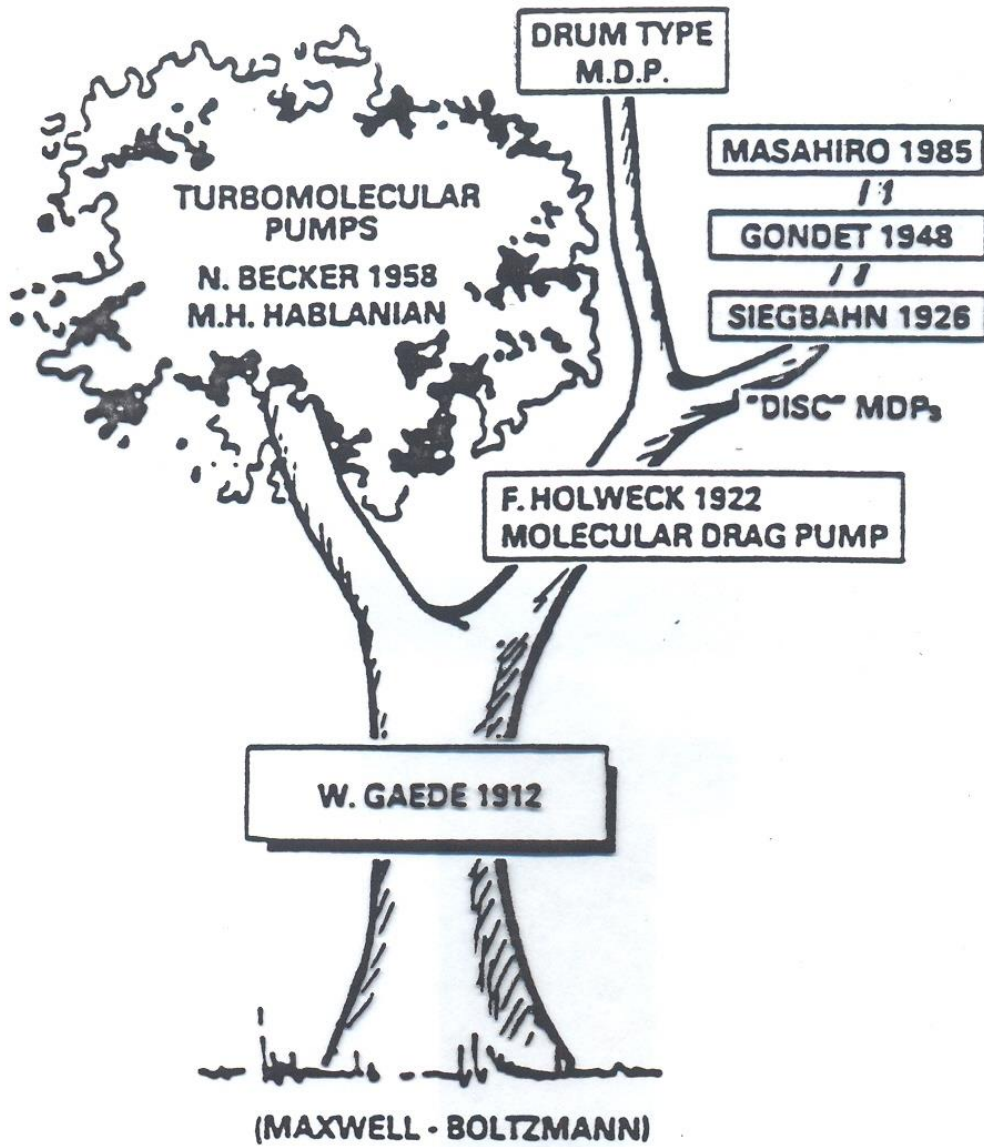
1. FECHAR VP
2. ABRIR VD
3. BOMBEAR A CÂMARA ATÉ < 0,1 mbar
4. LIGAR VENTILADOR / ÁGUA DE REFRIGERAÇÃO



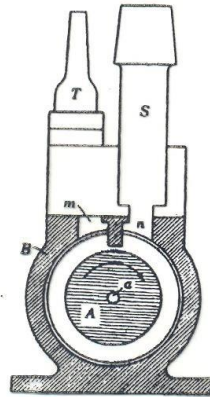
1. FECHAR VA (AR)
2. FECHAR VP
3. ABRIR VD
4. BOMBEAR CÂMARA ATÉ < 0,1 mbar



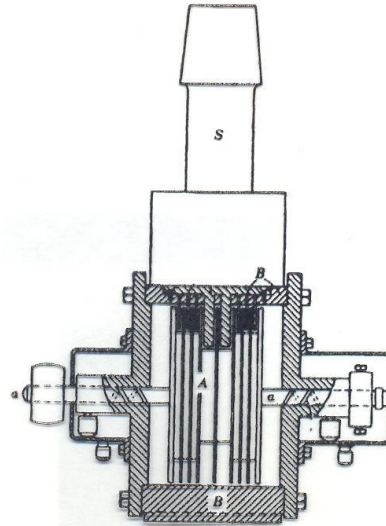




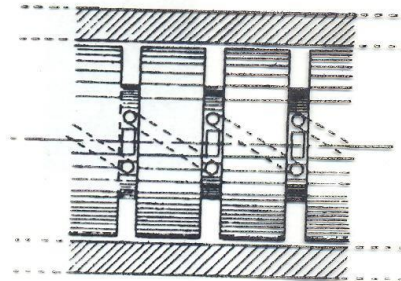
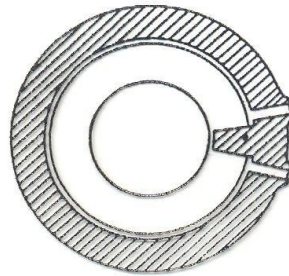
The mechanical molecular vacuum pumps family tree.



(a)



(b)

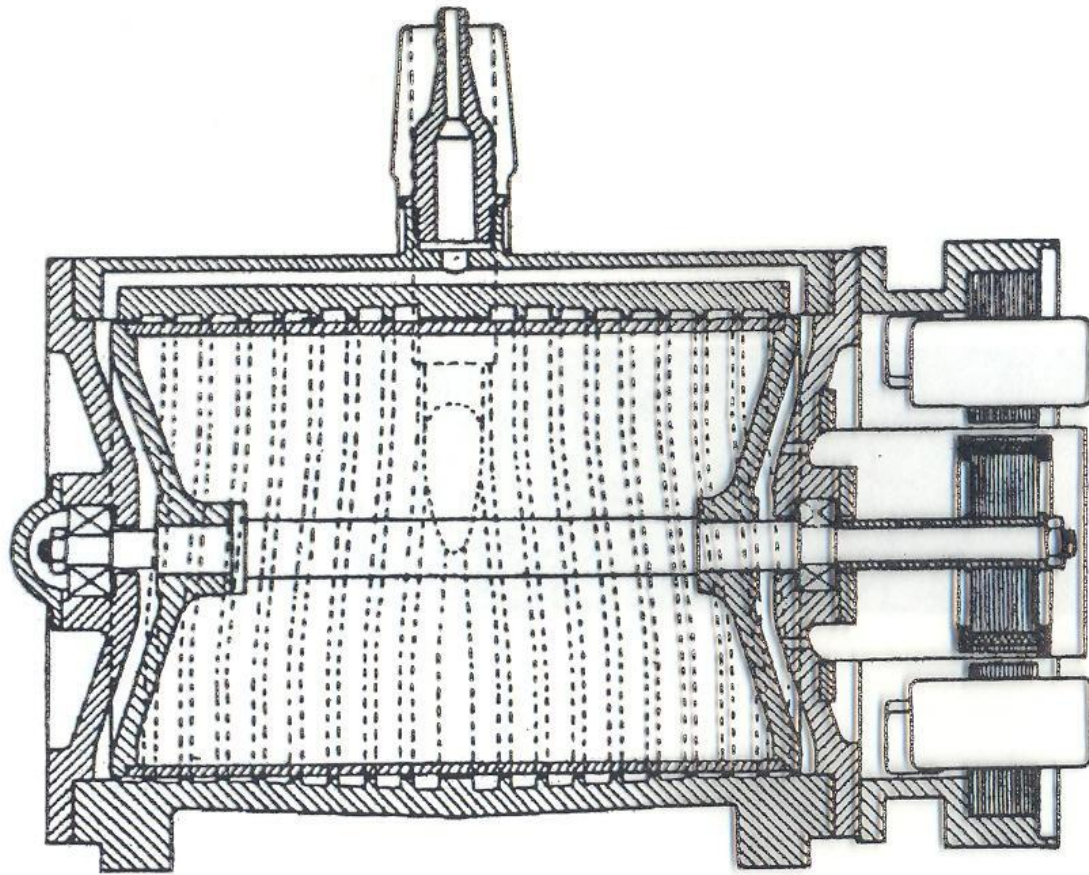


(c)

Bomba Molecular de Gaede

- a) vista frontal em corte; b) vista lateral em corte;
 c) desenho mostrando vários estágios da bomba.

A - rotor com vários estágios
 B - corpo da bomba
 m - região de maior pressão
 n - região de menor pressão
 T - saída para a bomba de pré-vácuo
 S - entrada da bomba



Bomba Molecular de Holweck. As moléculas do gás entrando pelo centro são empurradas para os lados pelo rotor em alta velocidade.

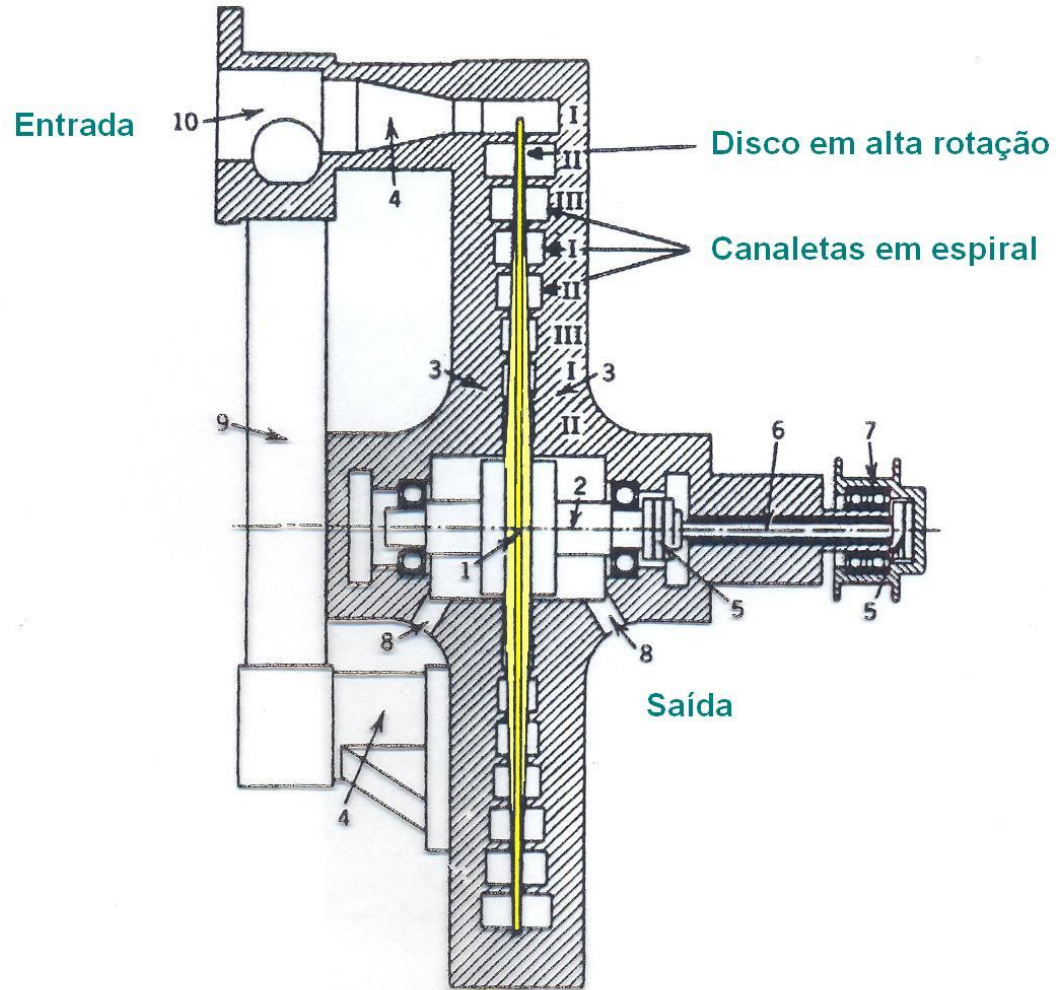
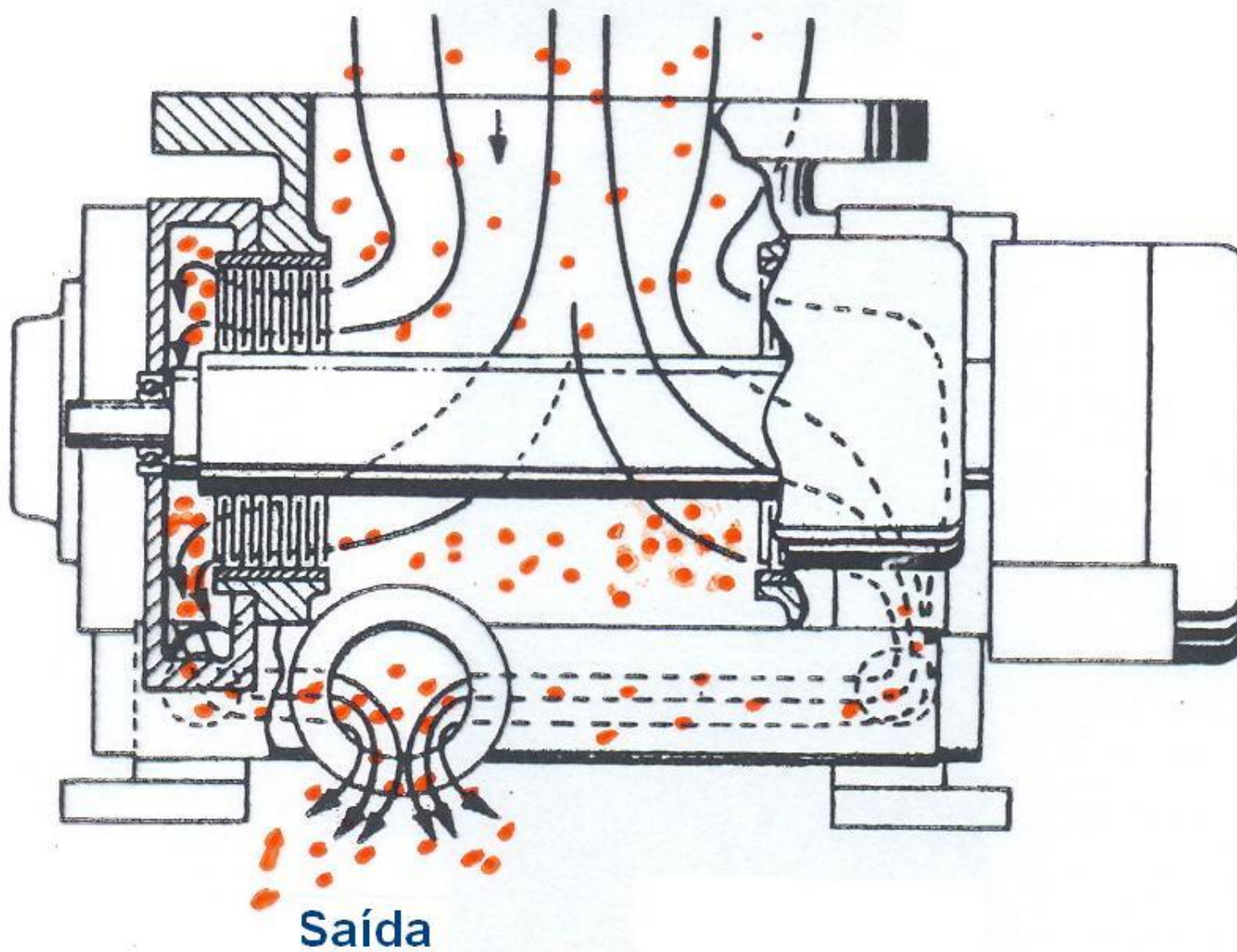
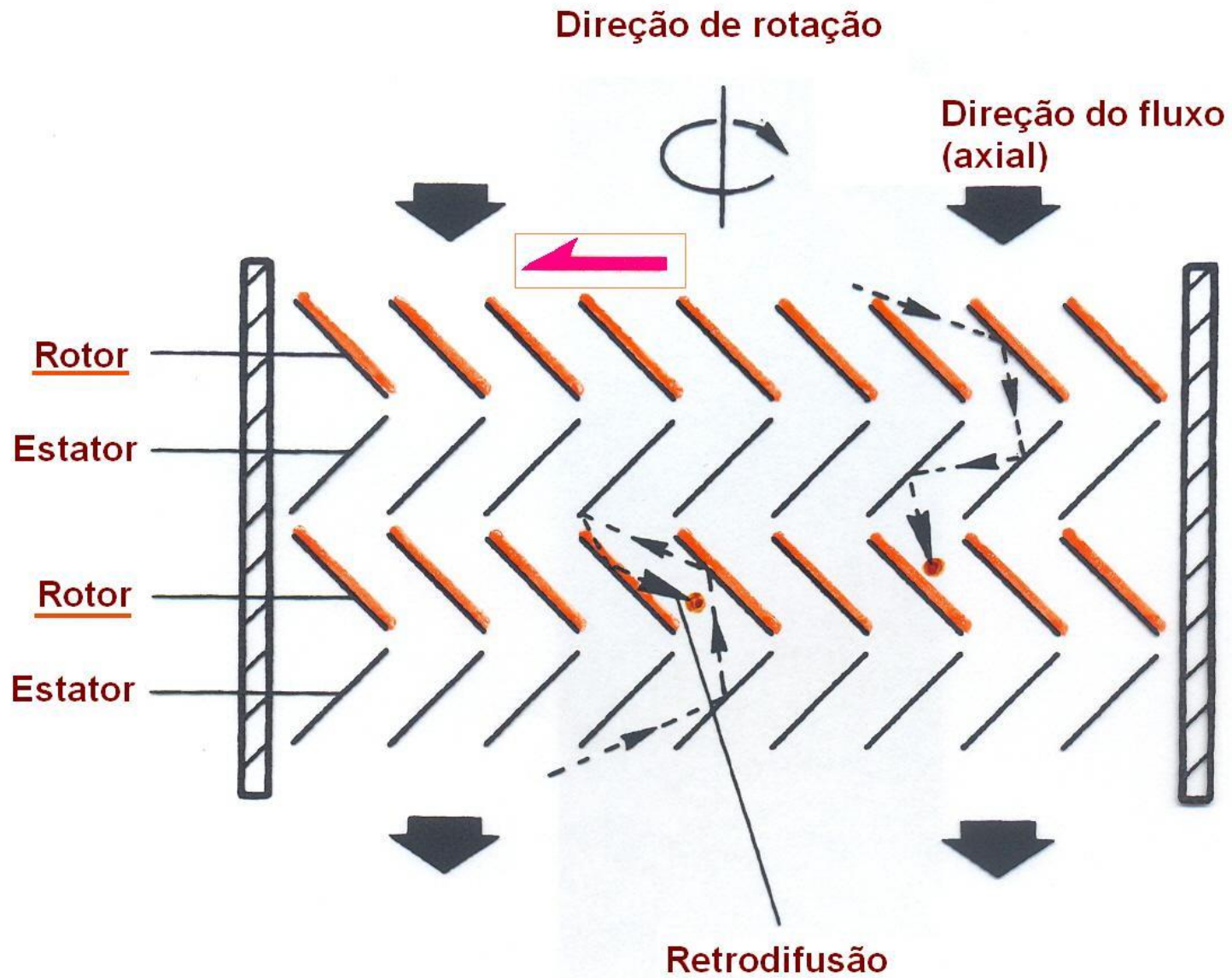


Diagrama esquemático da Bomba Molecular de Siegbahn
(diâmetro do disco: 54 cm)

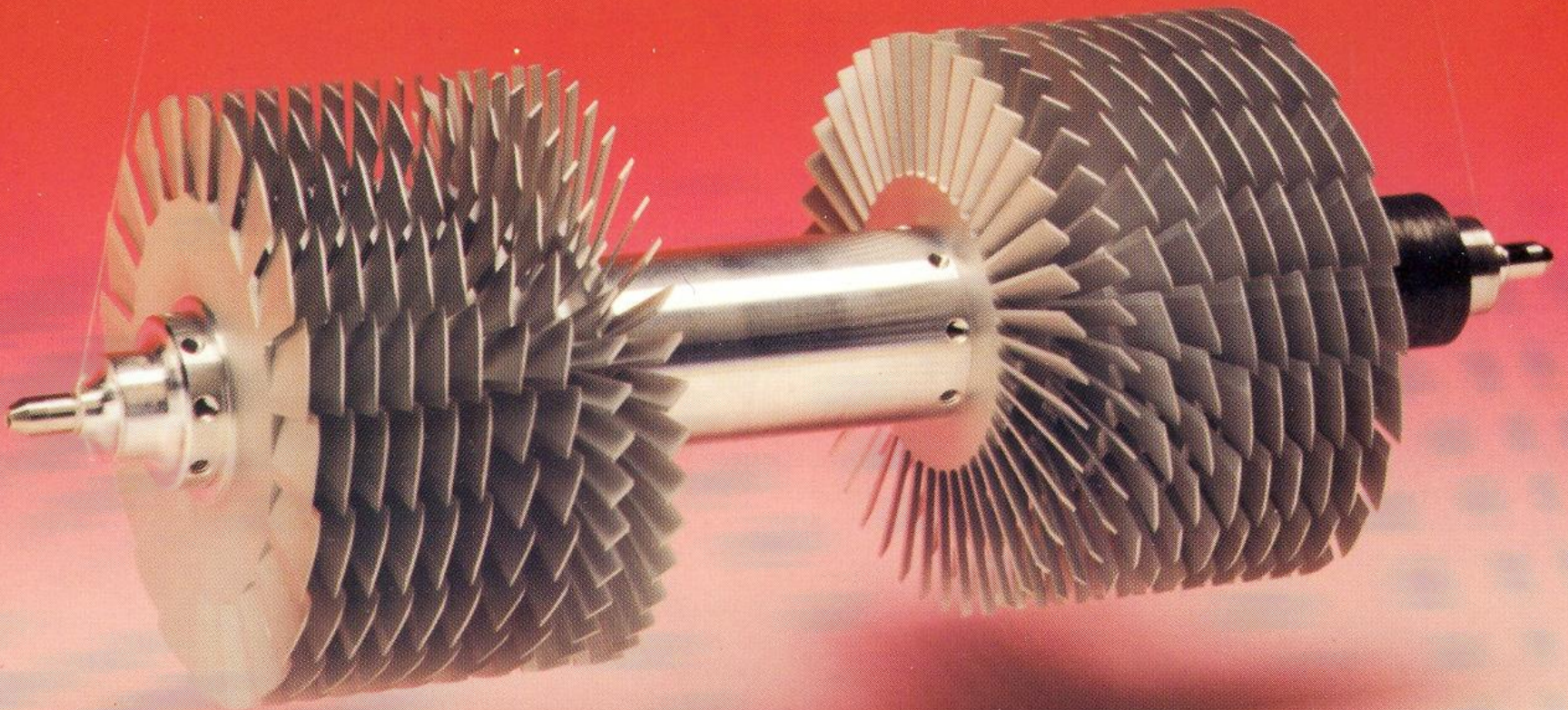
Entrada

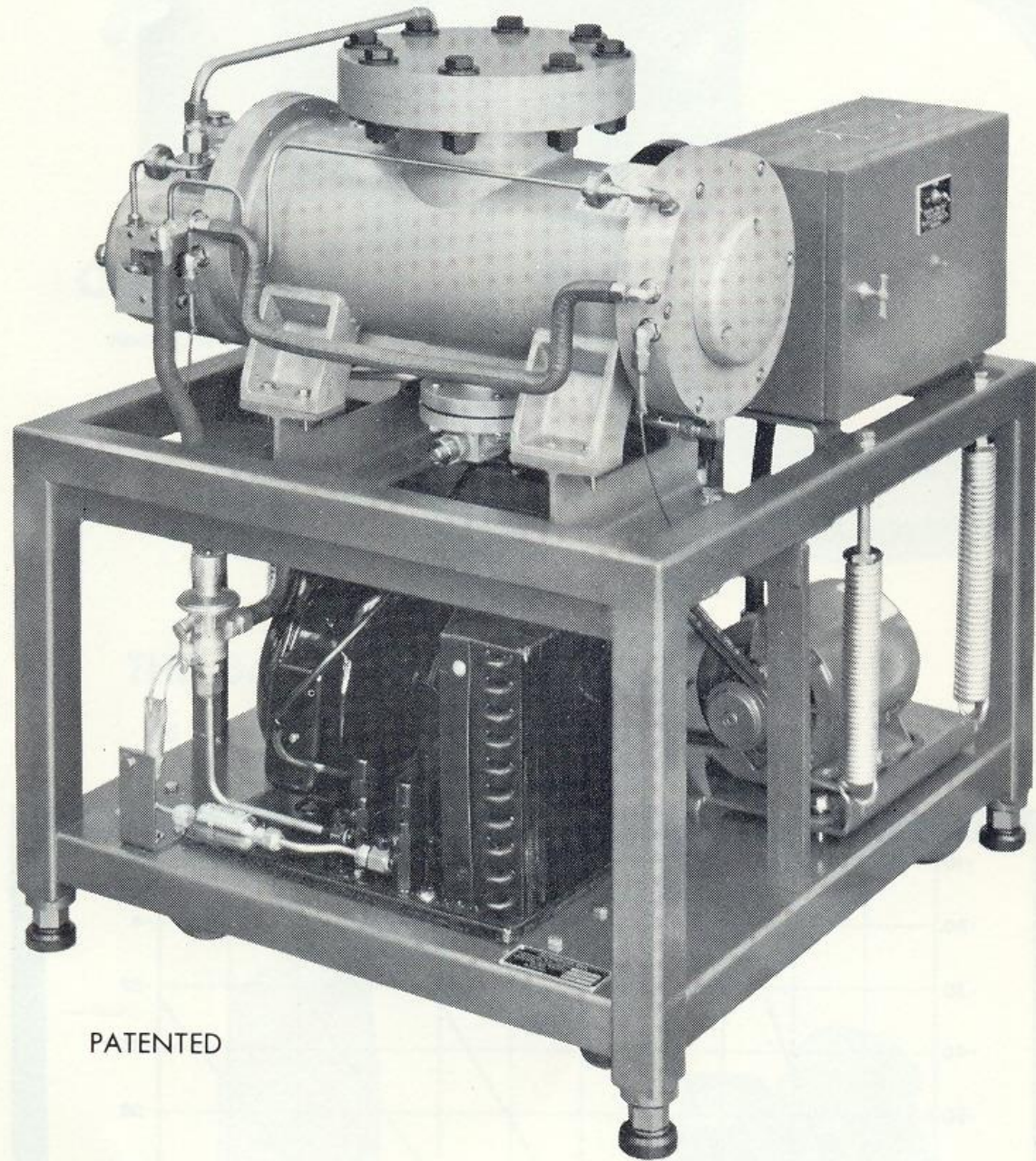


BOMBA TURBOMOLECULAR

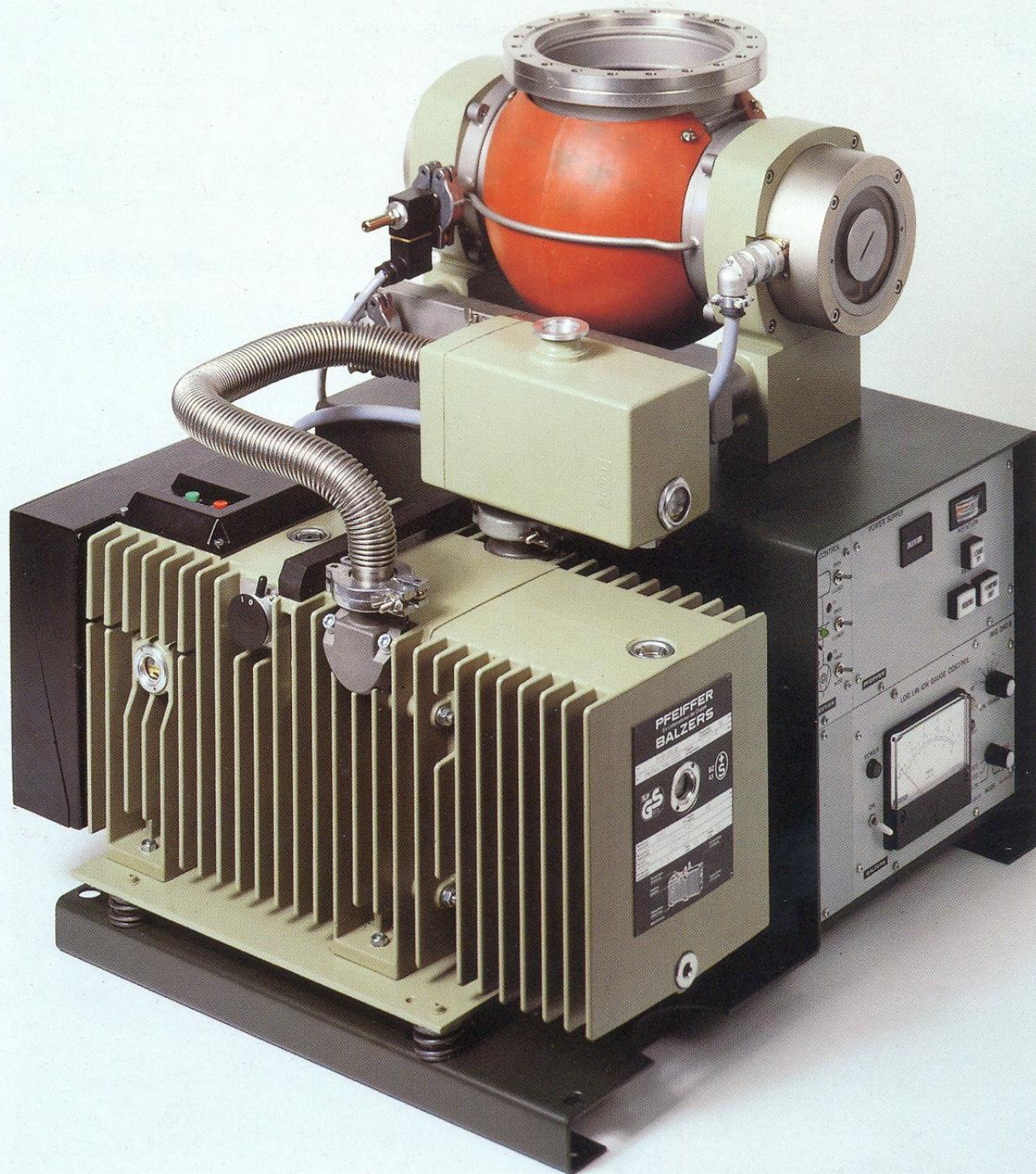


BOMBA TURBOMOLECULAR (HORIZONTAL) - ROTOR

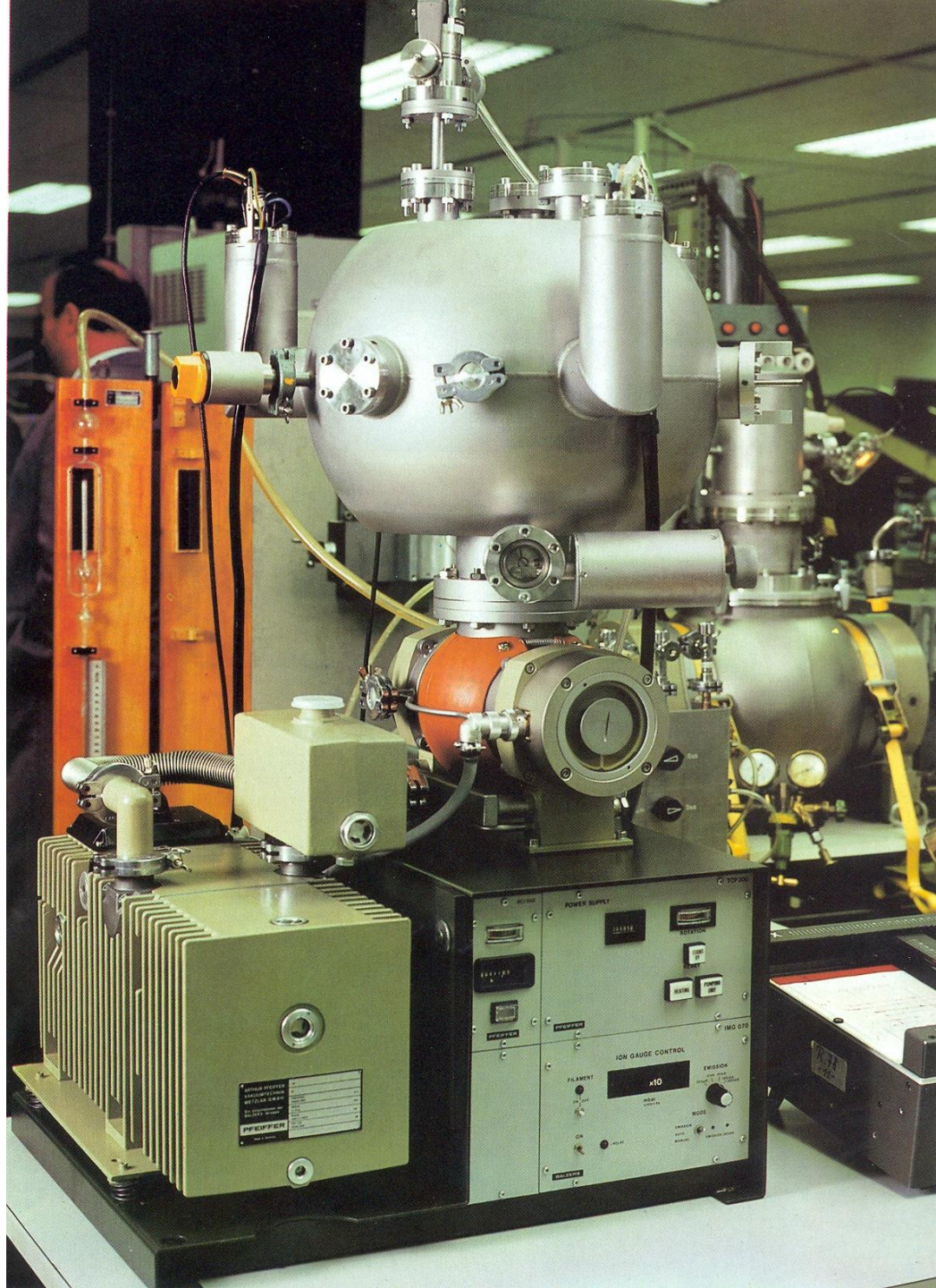




PATENTED

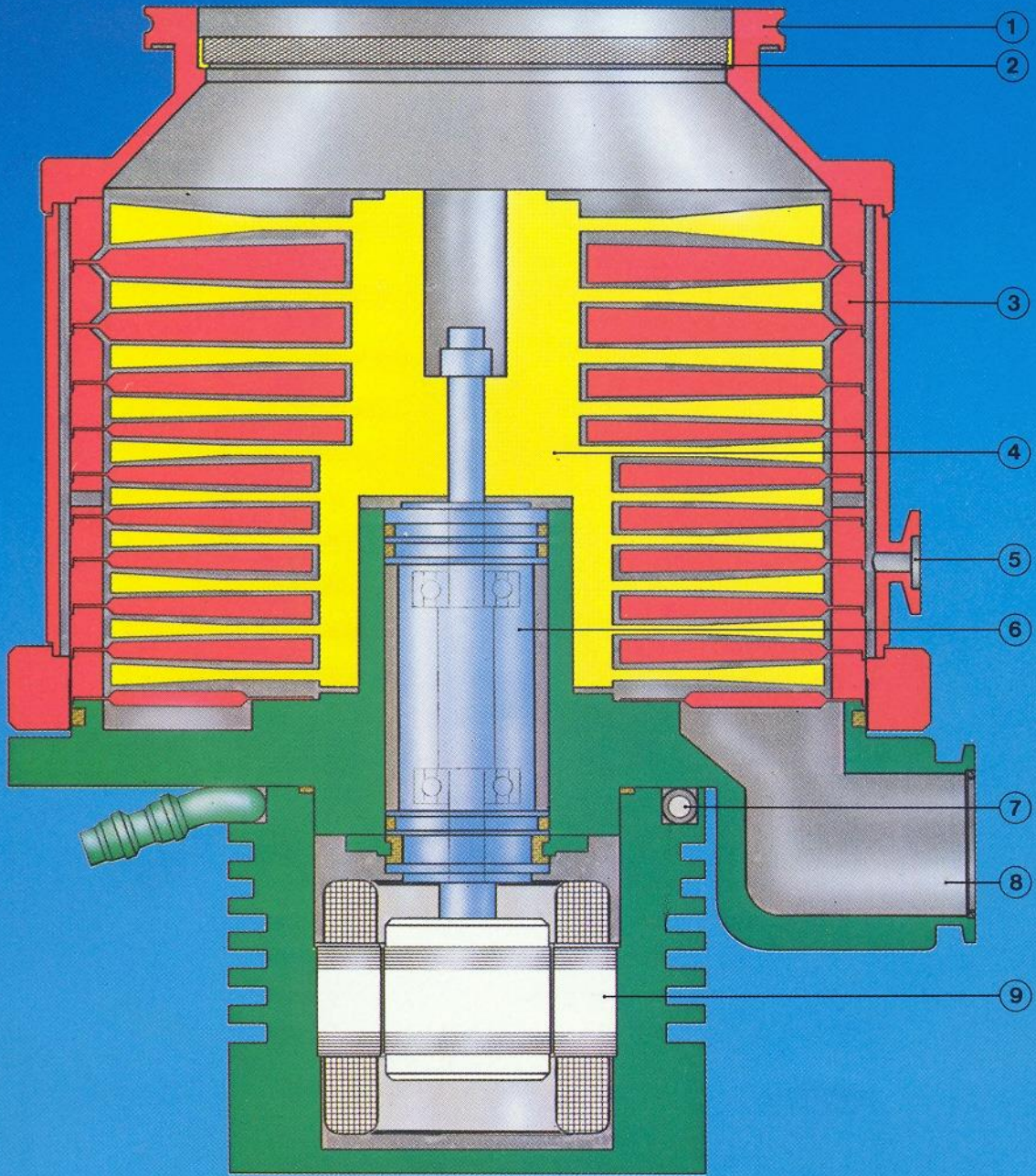


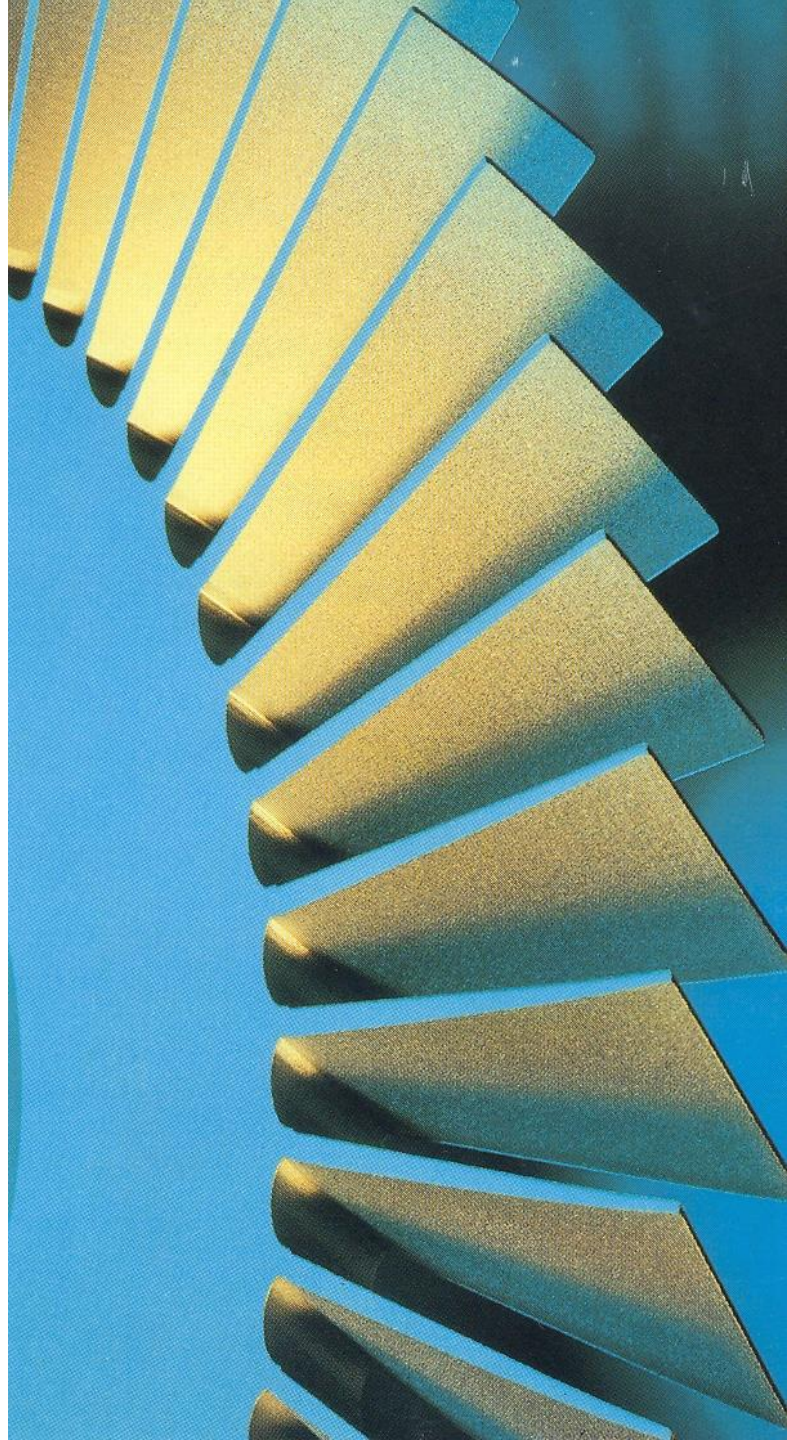




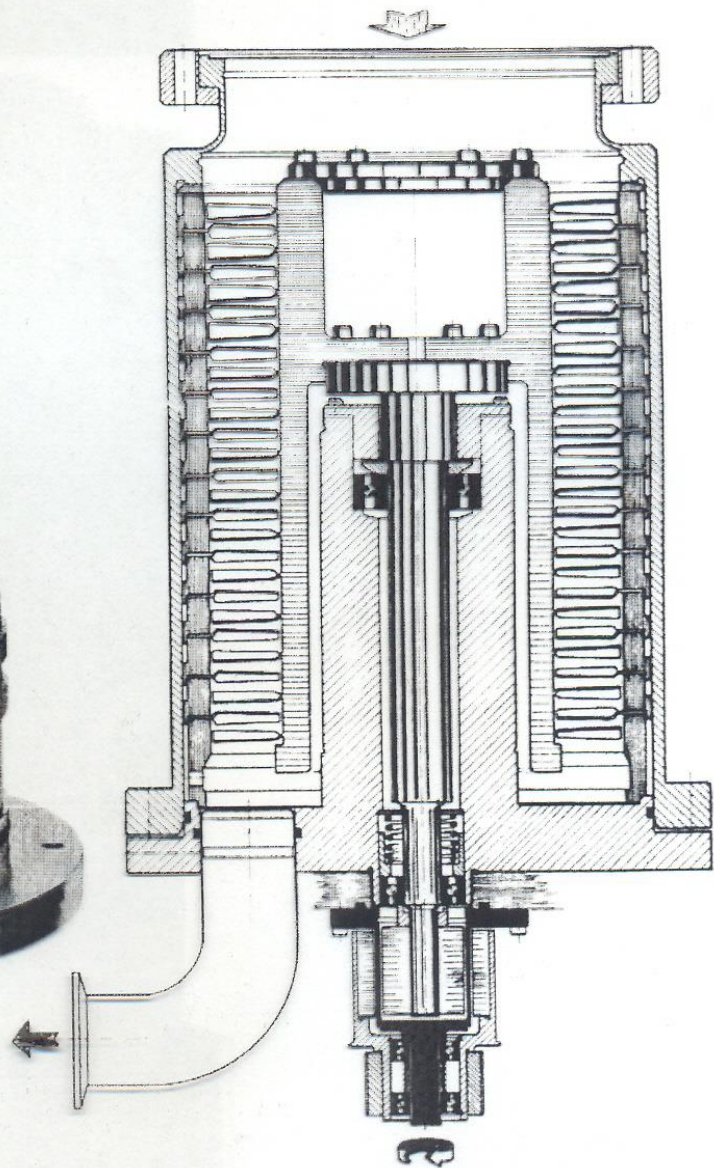
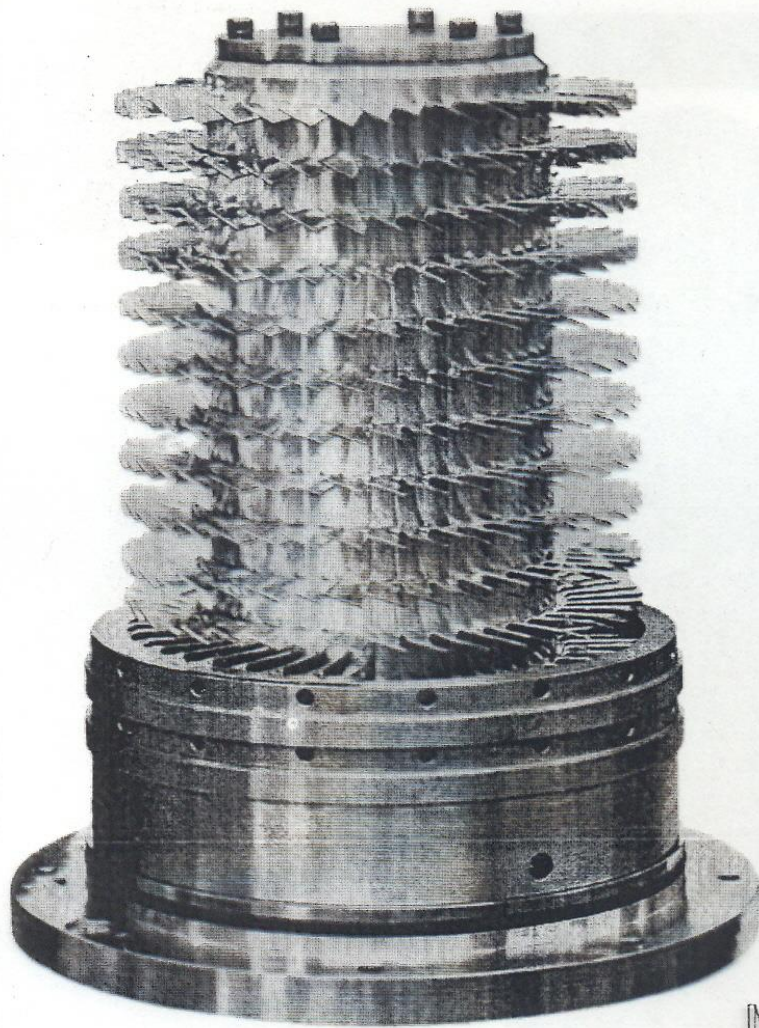






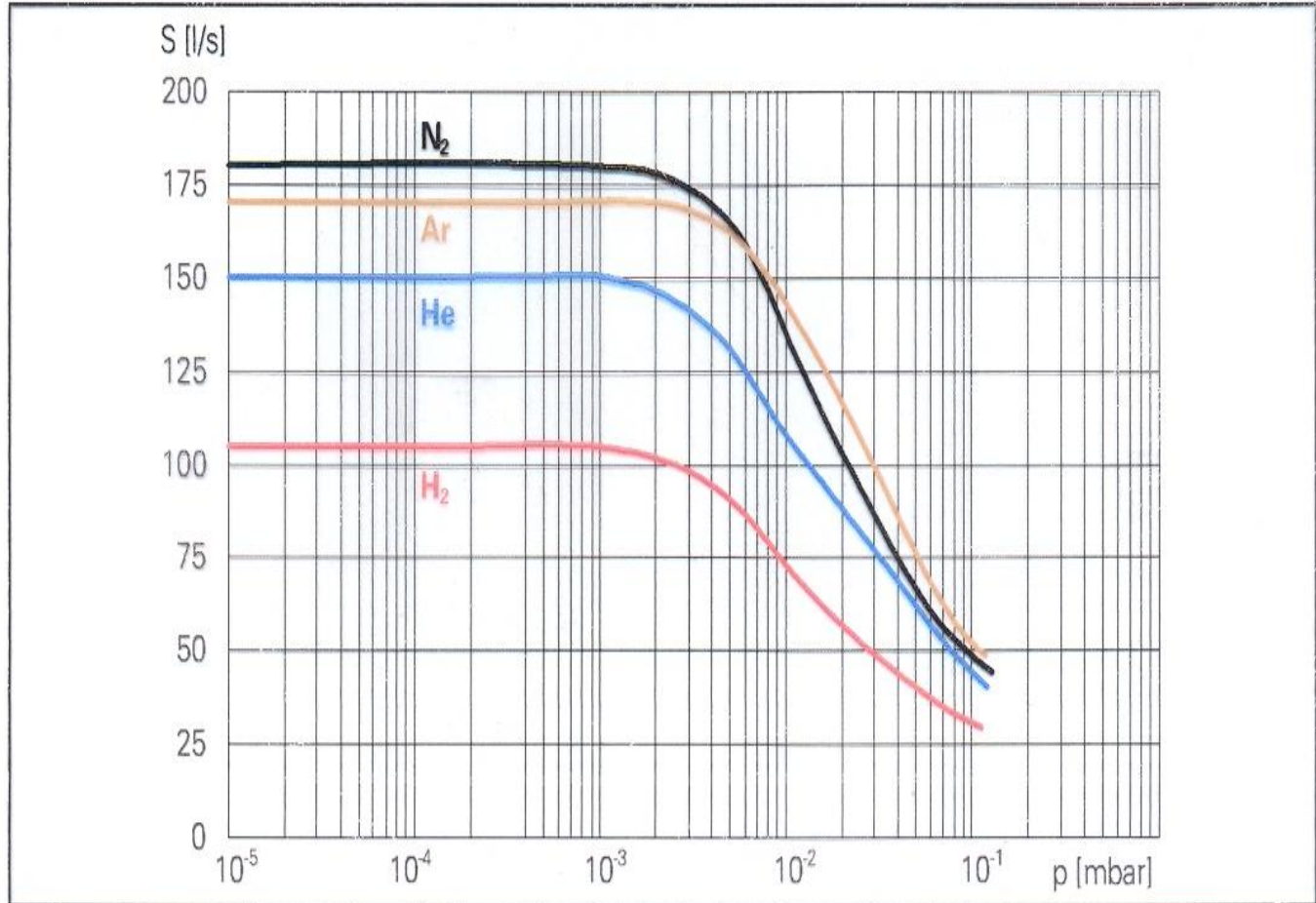


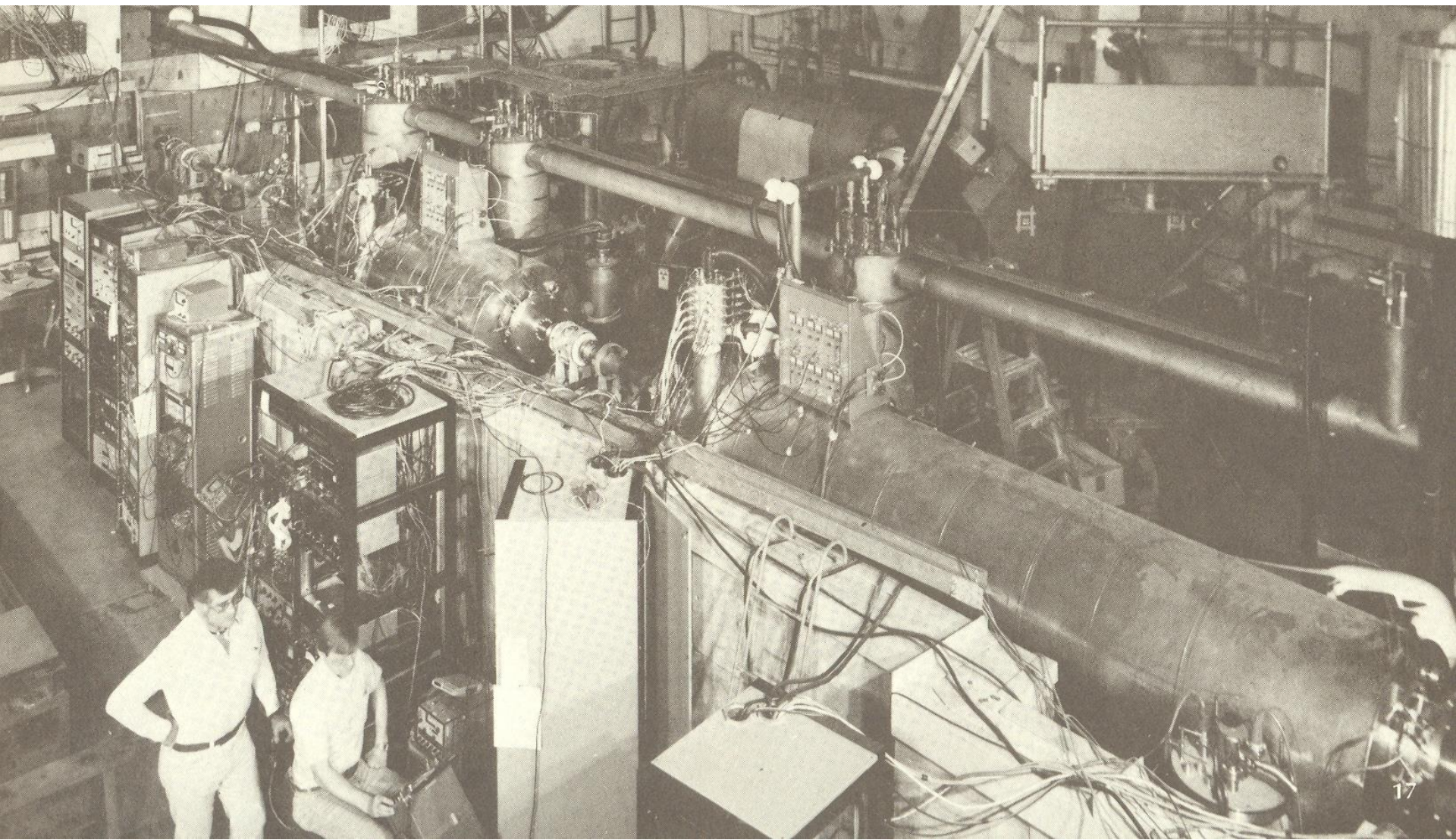




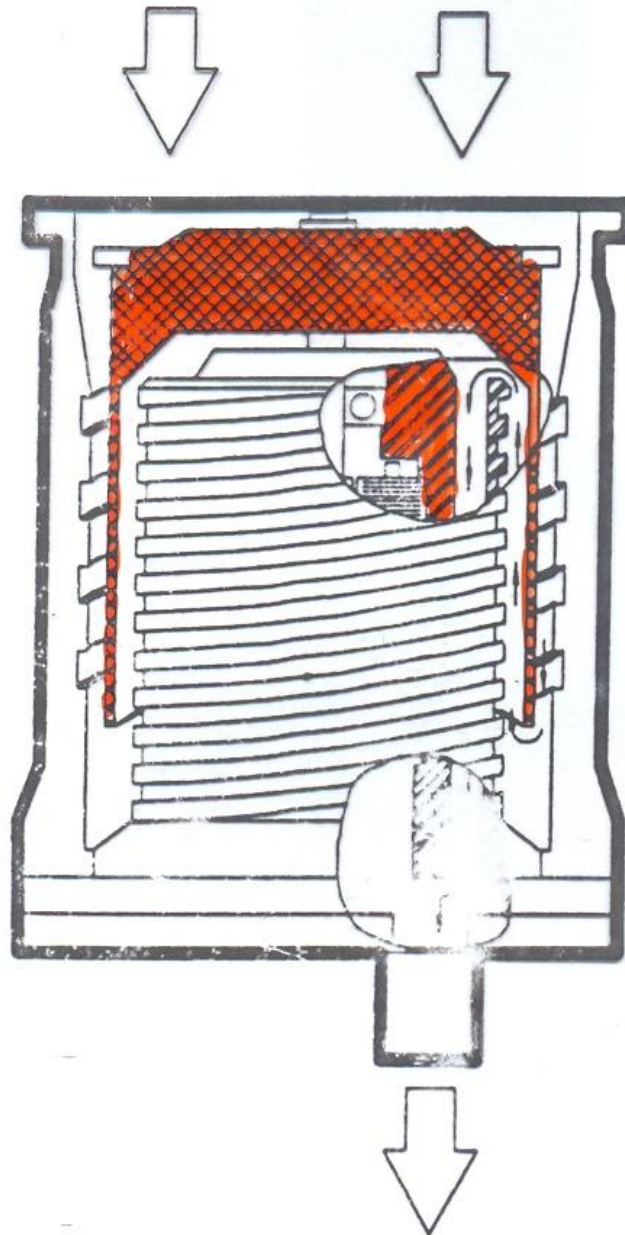


Pumping speed



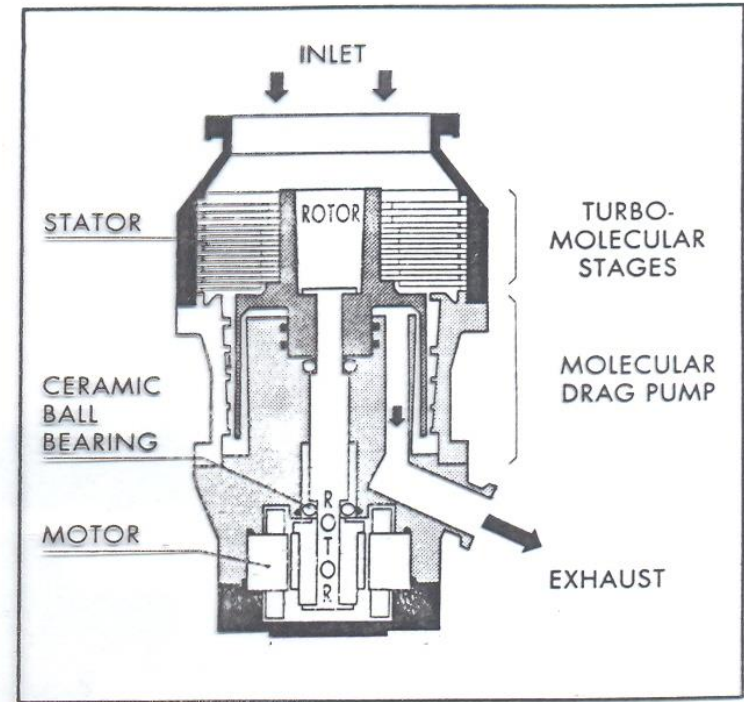
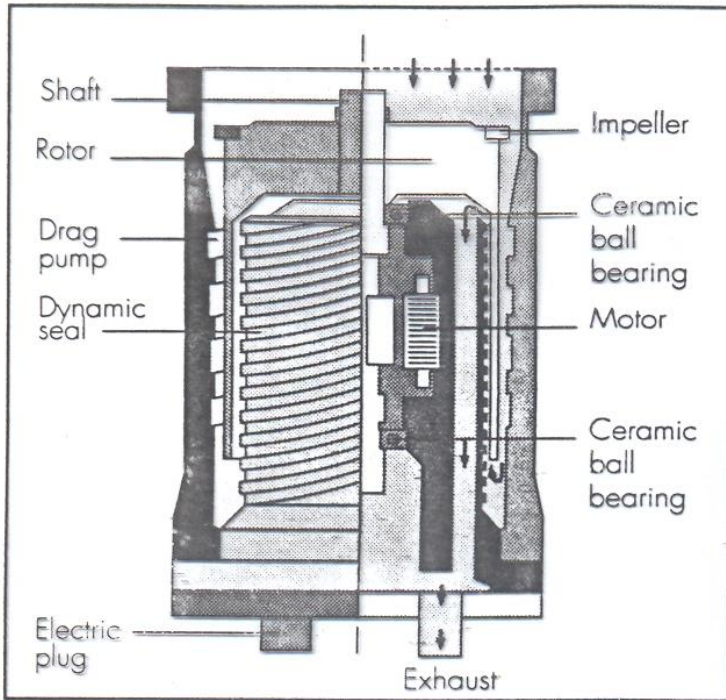


BOMBA MOLECULAR (HOLWECK) - MDP



BOMBA MOLECULAR (MDP)

BOMBA TURBOMOLECULAR + MDP

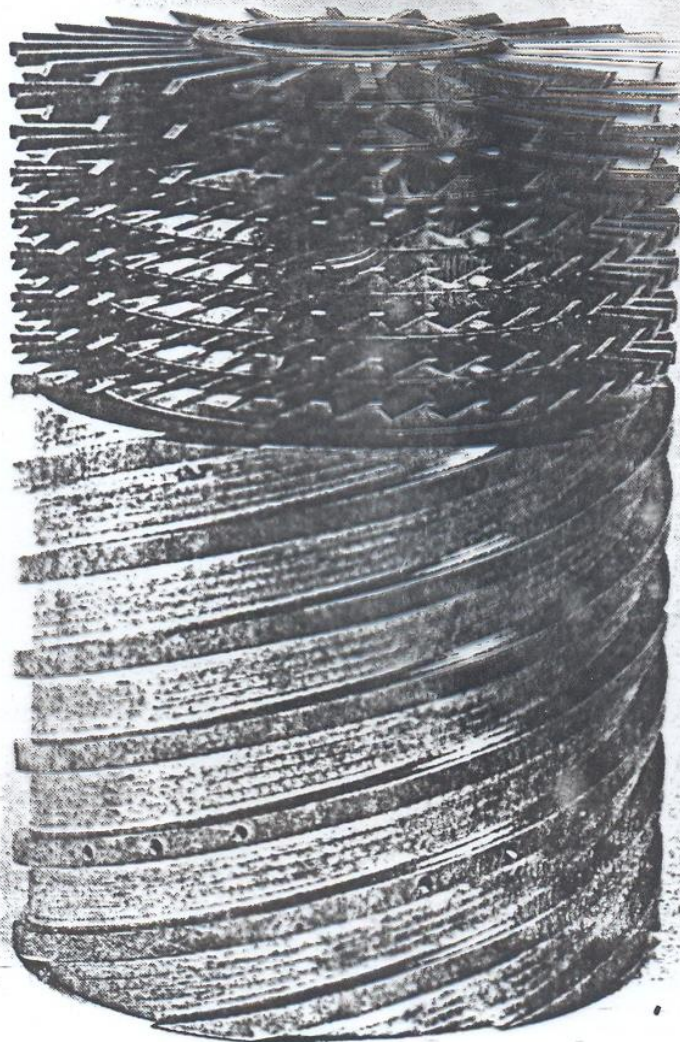


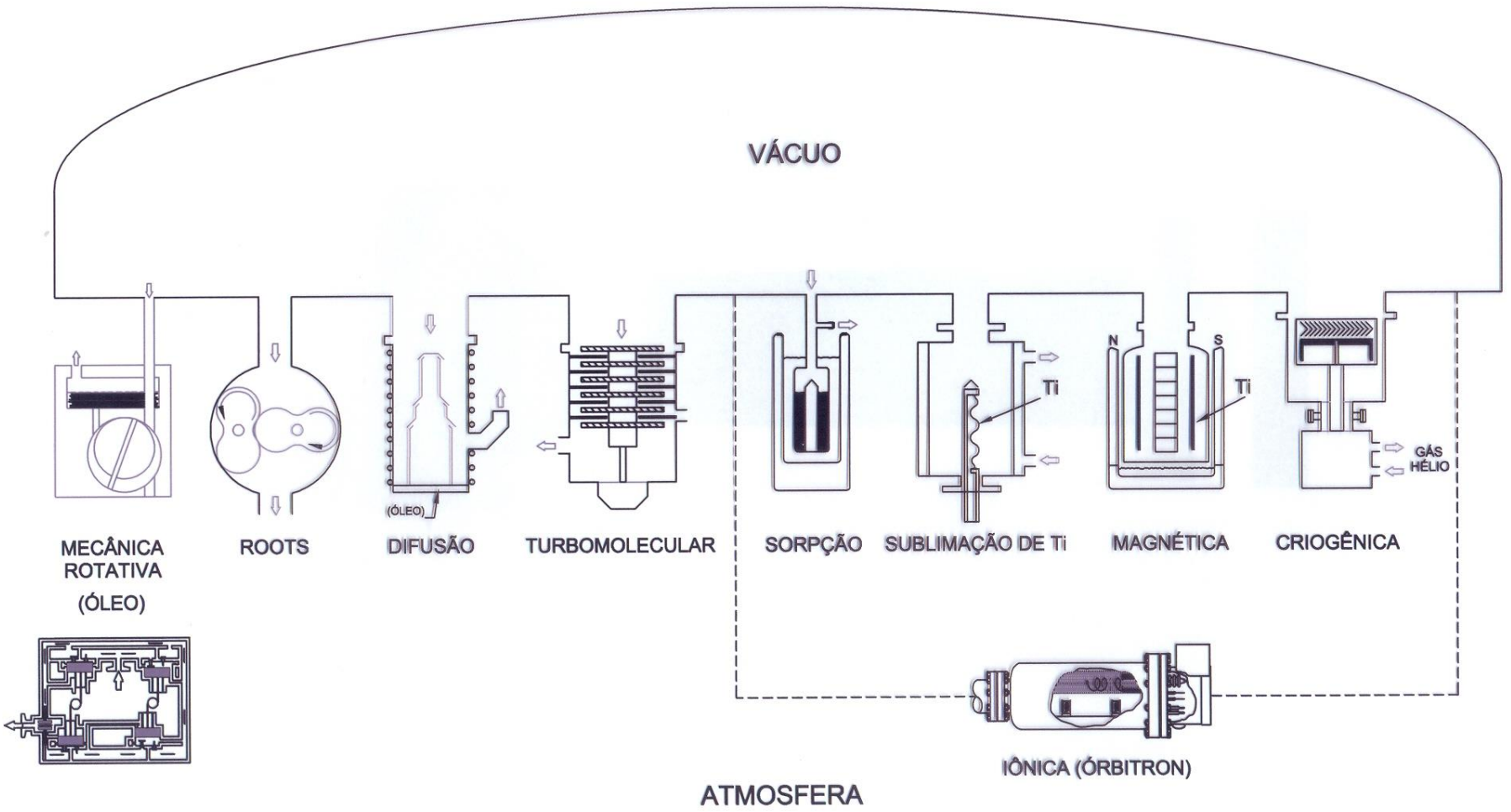
TURBO

+

MDP

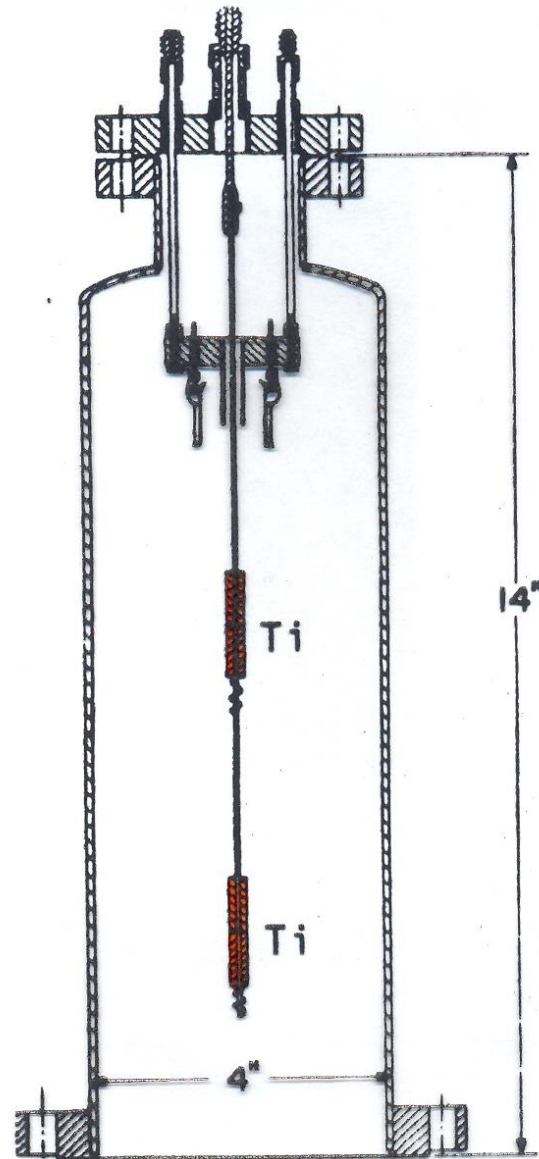
(ROTOR)

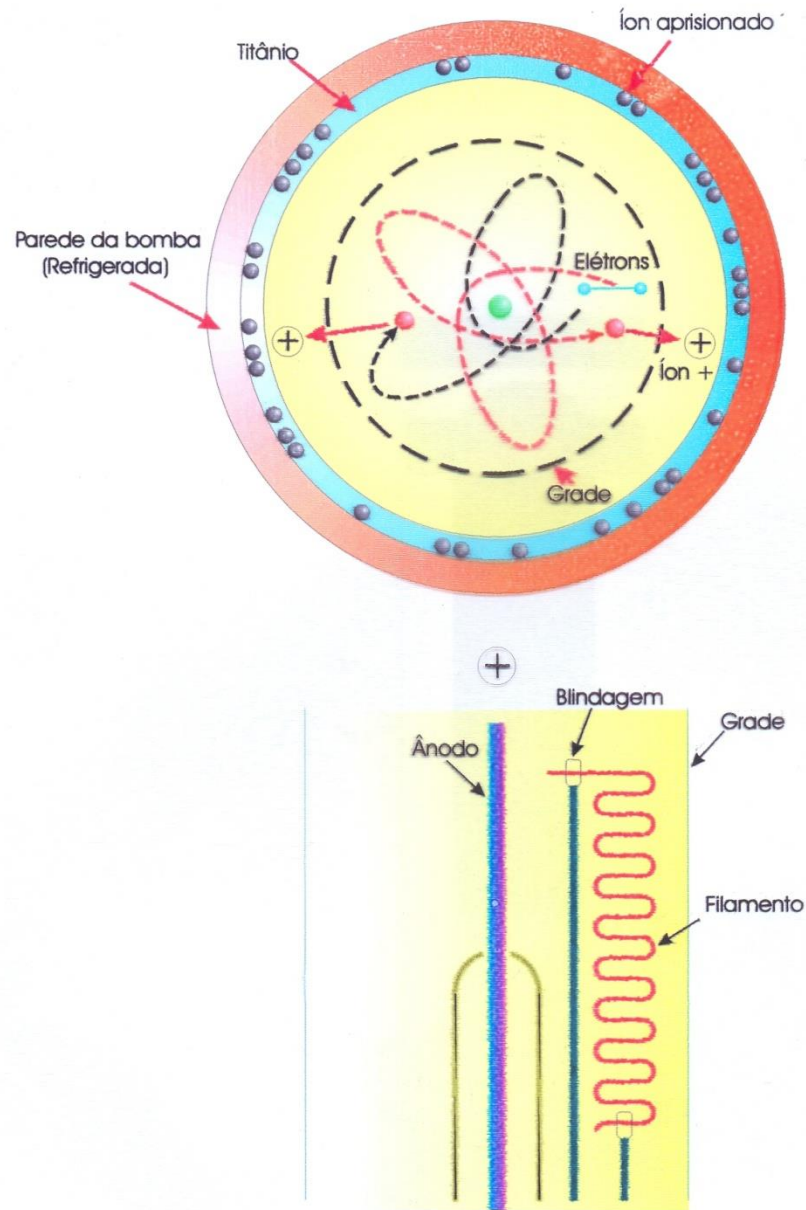




BOMBA IÔNICA

ÓRBITRON

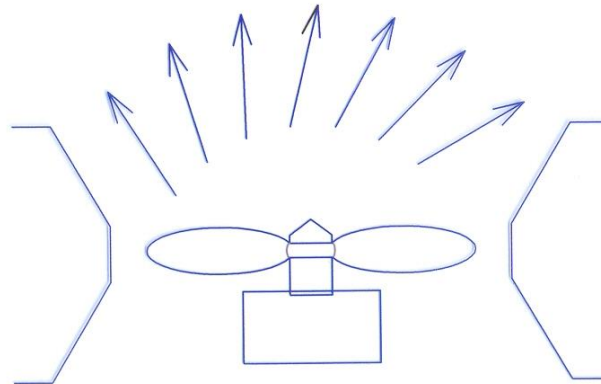
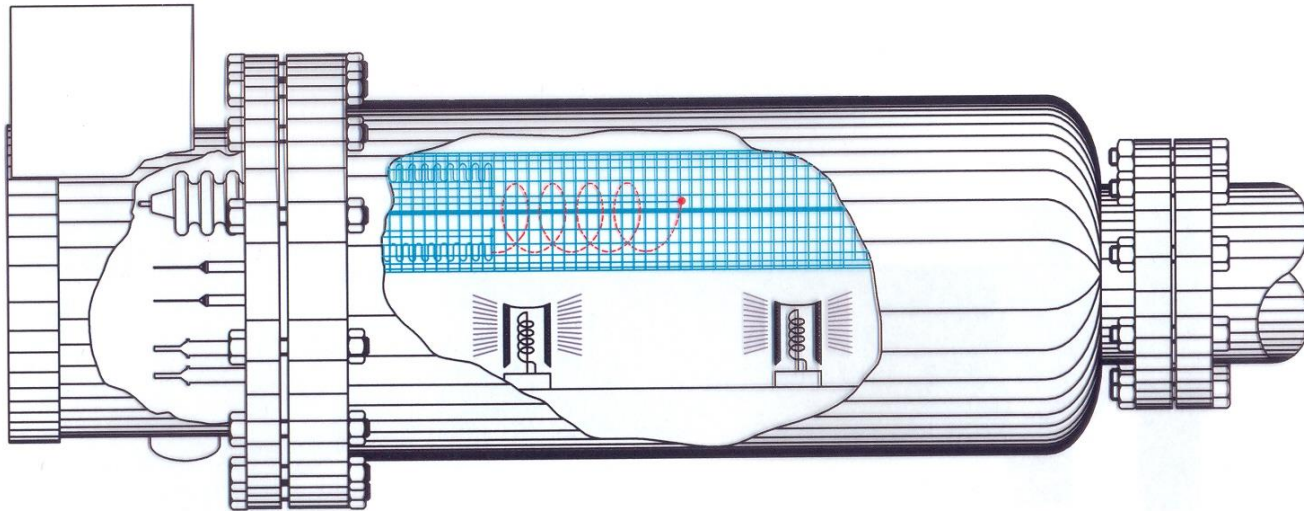




NEC GETTER-ION PUMP

MODEL 4DG4-3 (4" Inlet, 400 l/s)

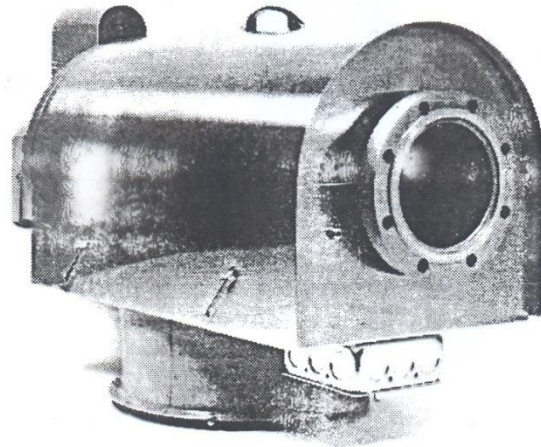
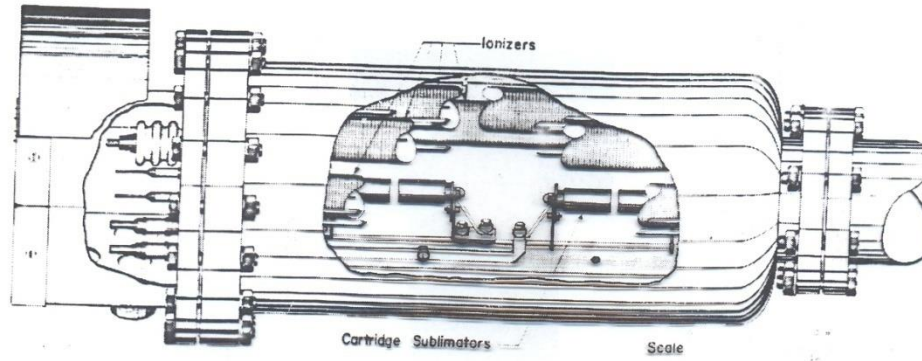
MODEL 4DI4-3 (6" Inlet, 800 l/s)

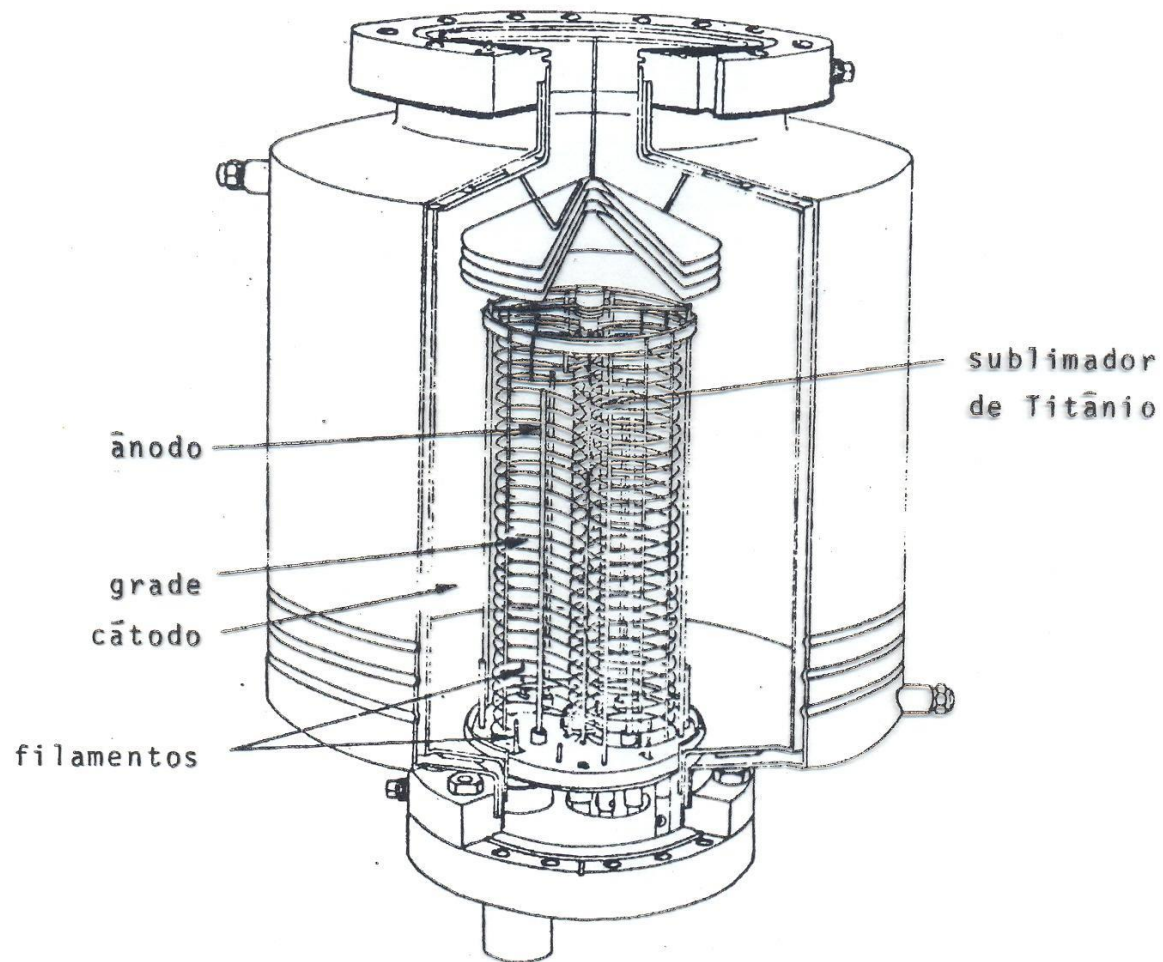


NEC GETTER-ION PUMP

MODEL 4DG4-3 (4" Inlet, 400 l/s)

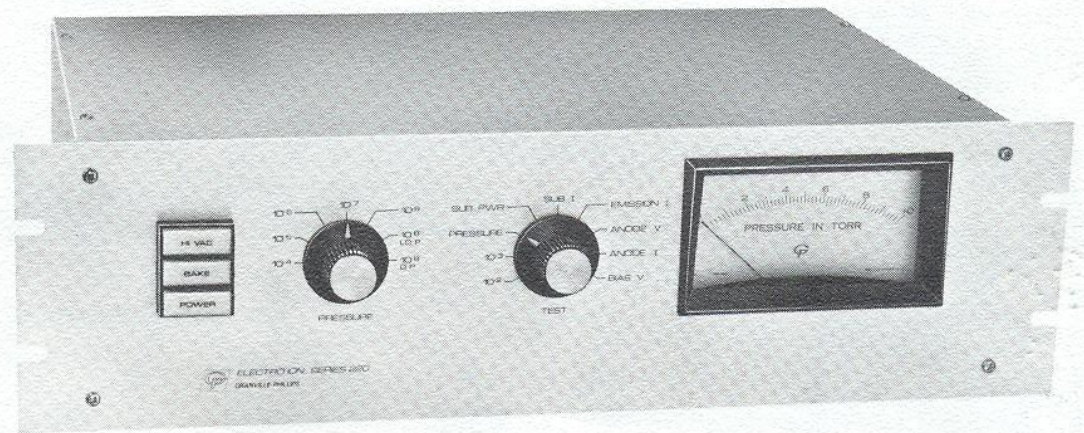
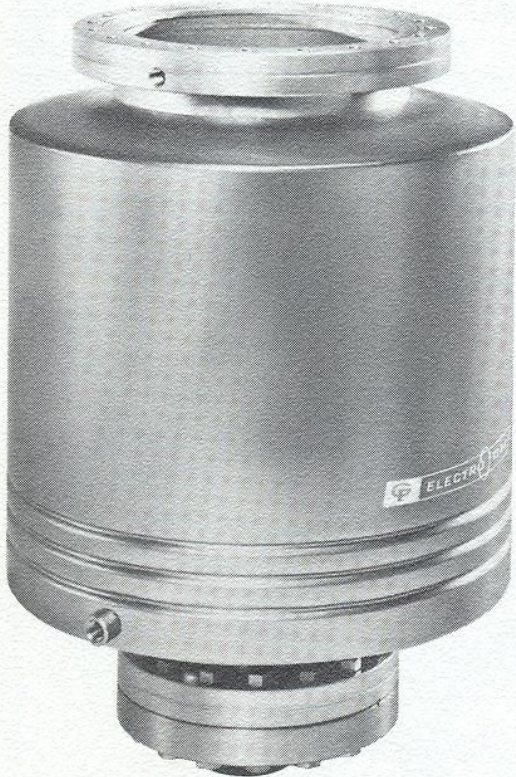
MODEL 4DI4-3 (6" Inlet, 800 l/s)





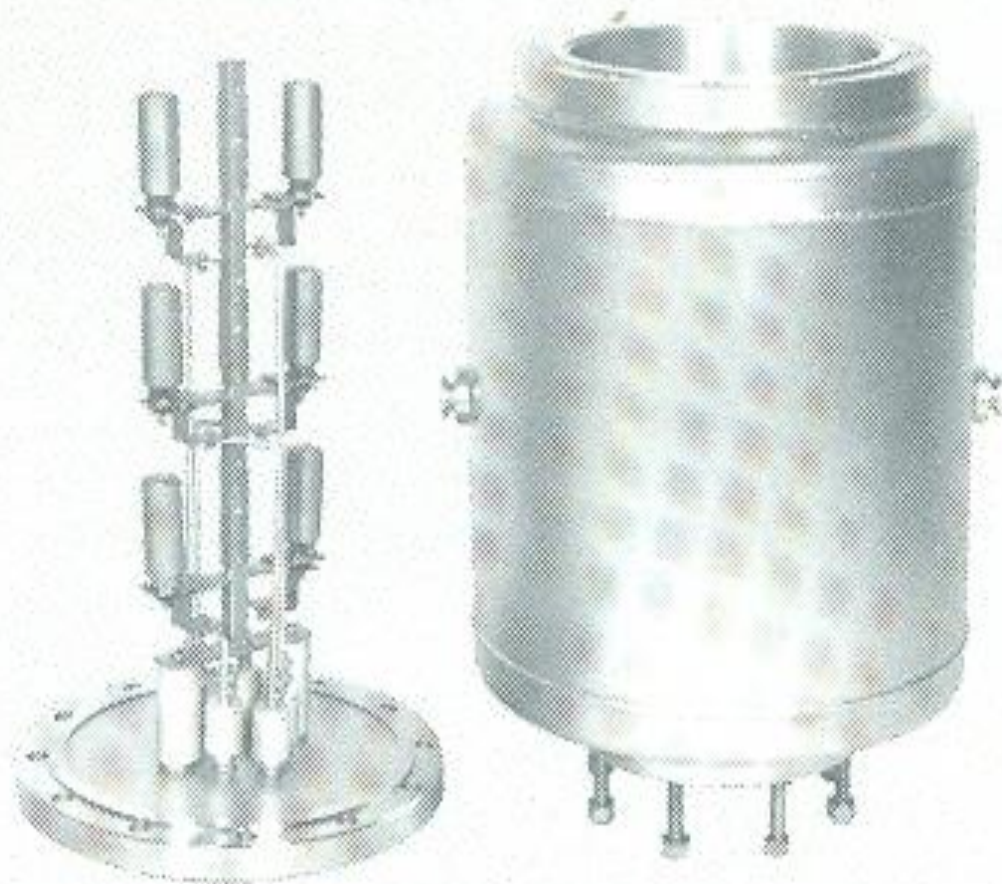
Bomba Iônica do tipo "getter-ion" (tríodo). São quatro orbitrons com grade polarizada circundando um único sublimador central, independente (Granville-Philips)

Electro Ion[®] Vacuum Pump Series 220



**BOMBA DE
TITÂNIO**

Model 6DGO-2



Features inverted feedthroughs to accommodate minimum length constraint. Used to handle ion source gas efflux in 3UH-HC Pelletron accelerator.

BOMBA DE SUBLIMAÇÃO DE TITÂNIO

DURAÇÃO DOS FILAMENTOS DE TITÂNIO (SUBLIMÁVEIS):

10E03 Torr

DIAS

10E06 Torr

SEMANAS

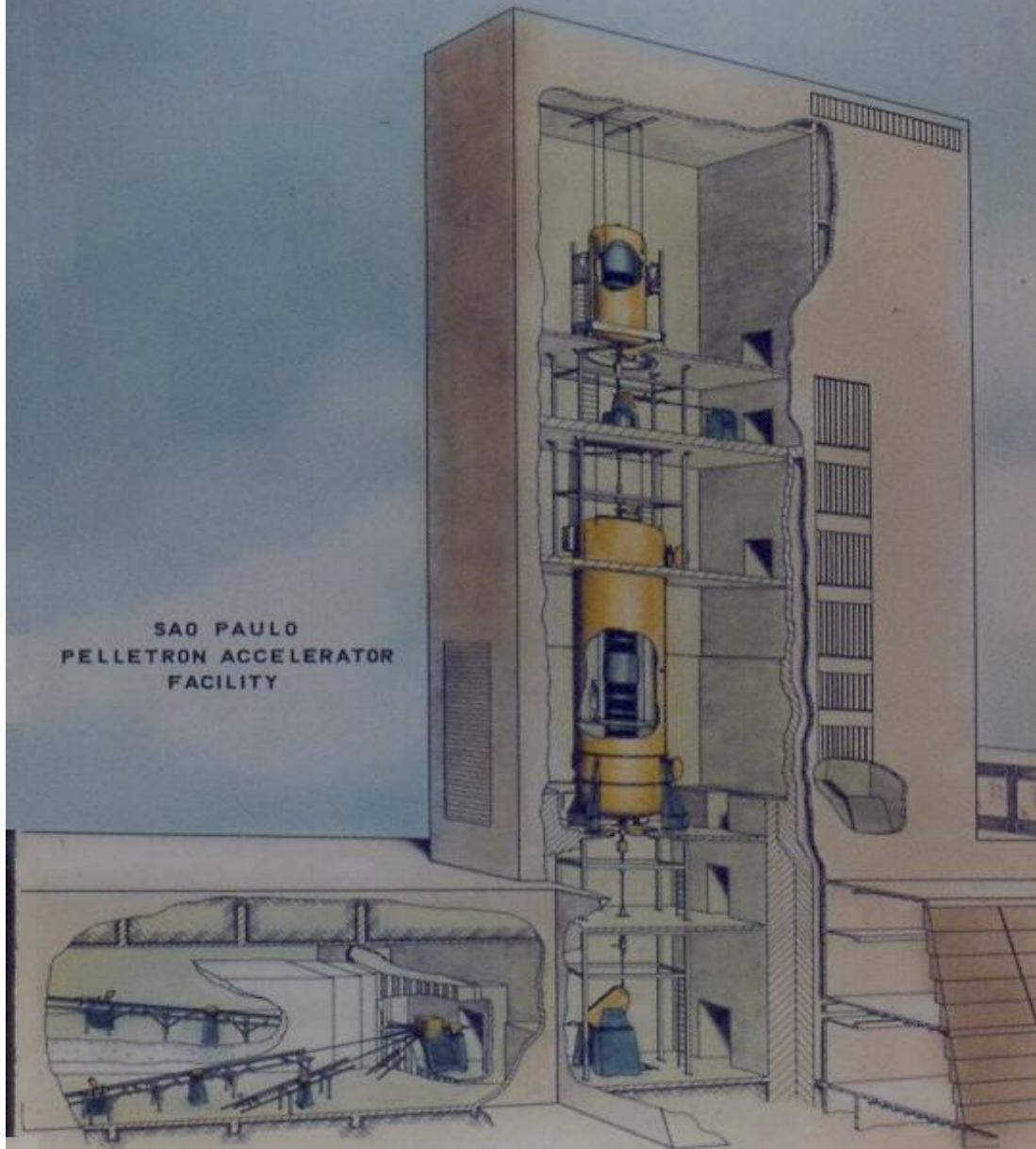
10E07 Torr

MESES

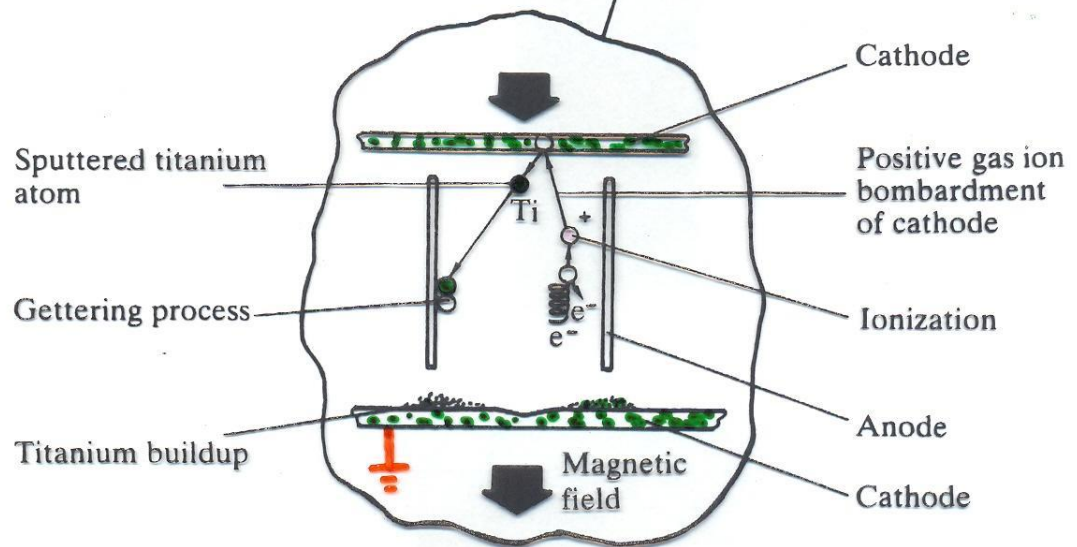
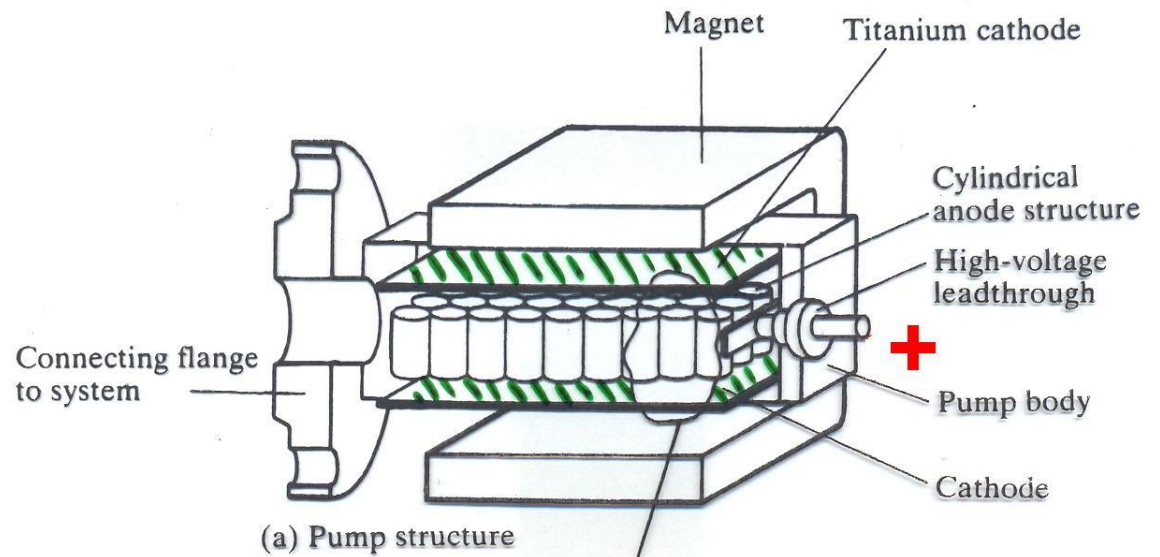
10E08 Torr

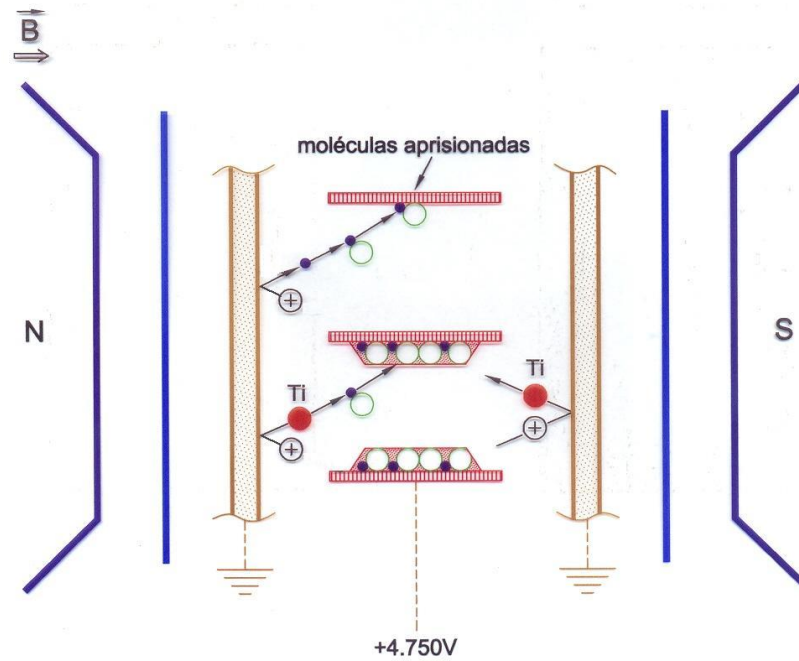
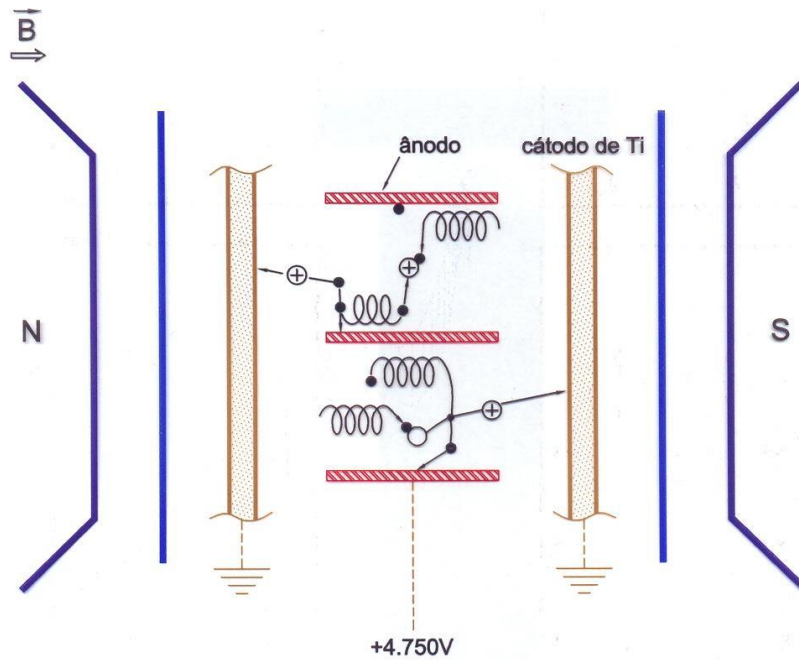
ANOS

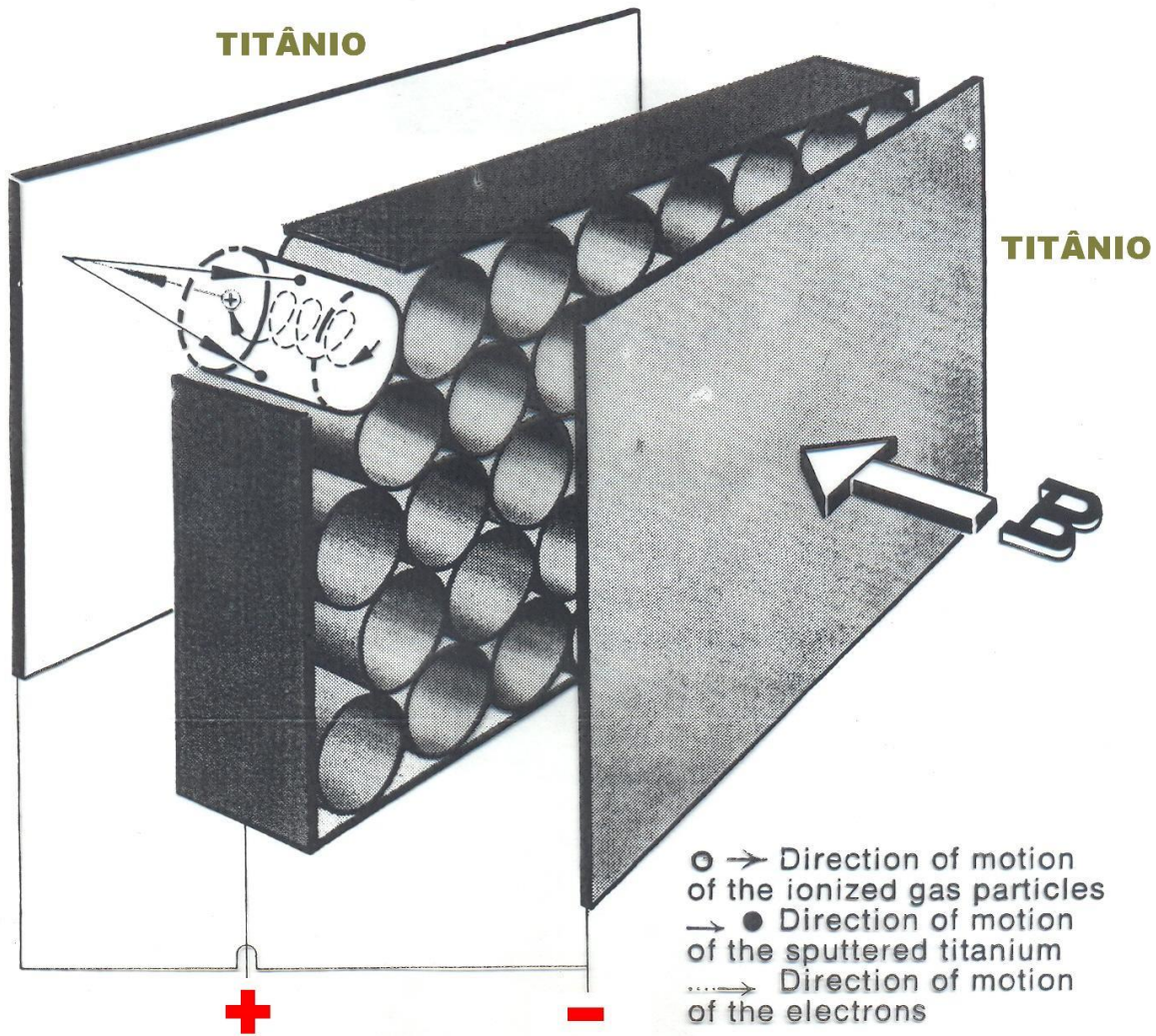
SAO PAULO
PELLETRON ACCELERATOR
FACILITY



BOMBA IÔNICA MAGNÉTICA

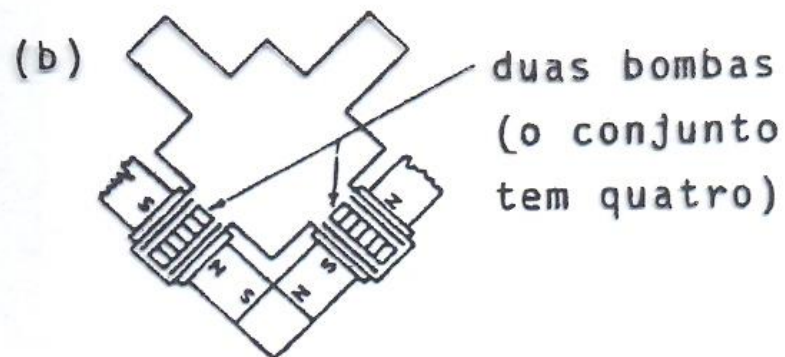
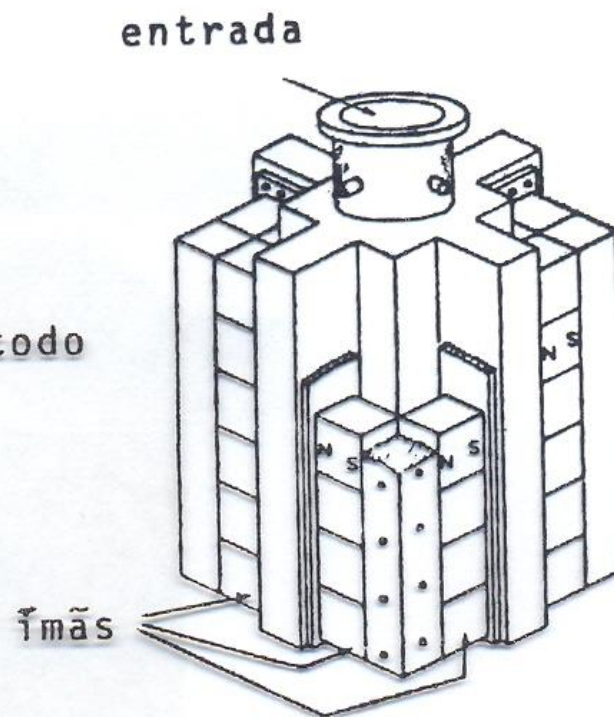
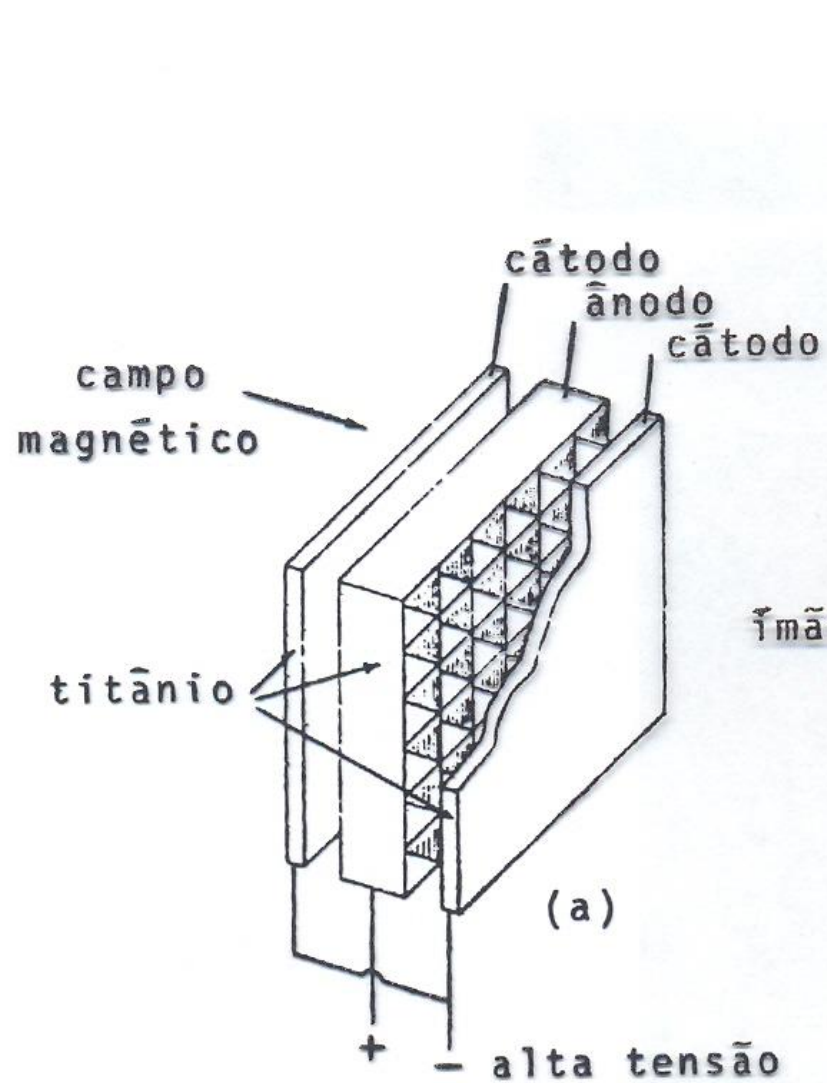


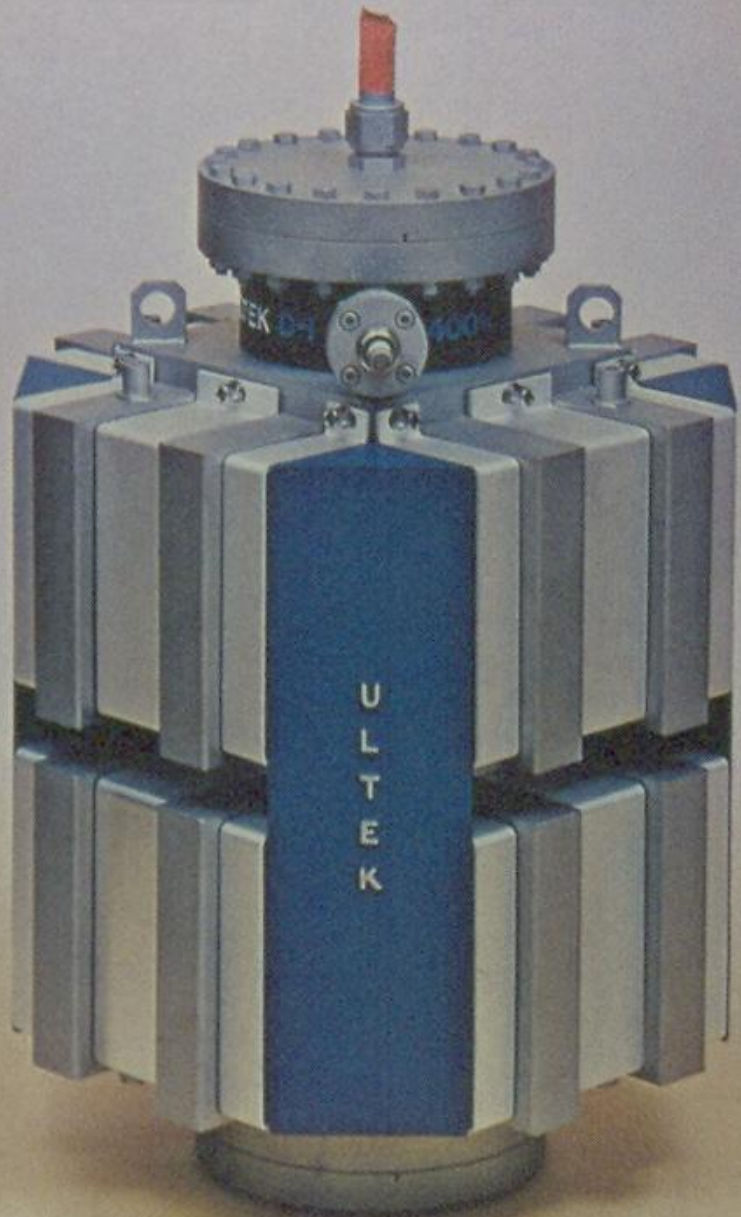


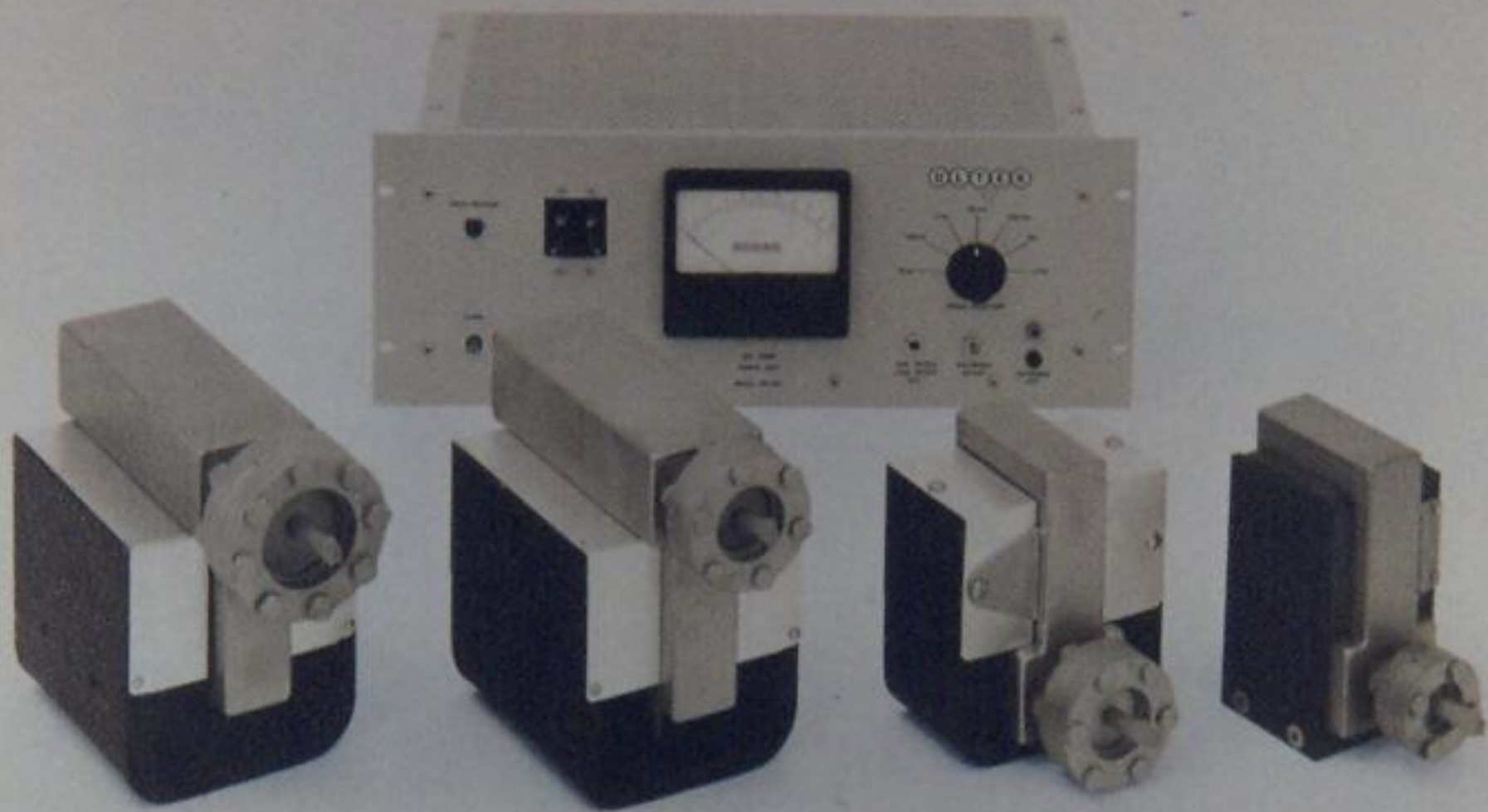


Mode of action of the sputter-ion pump

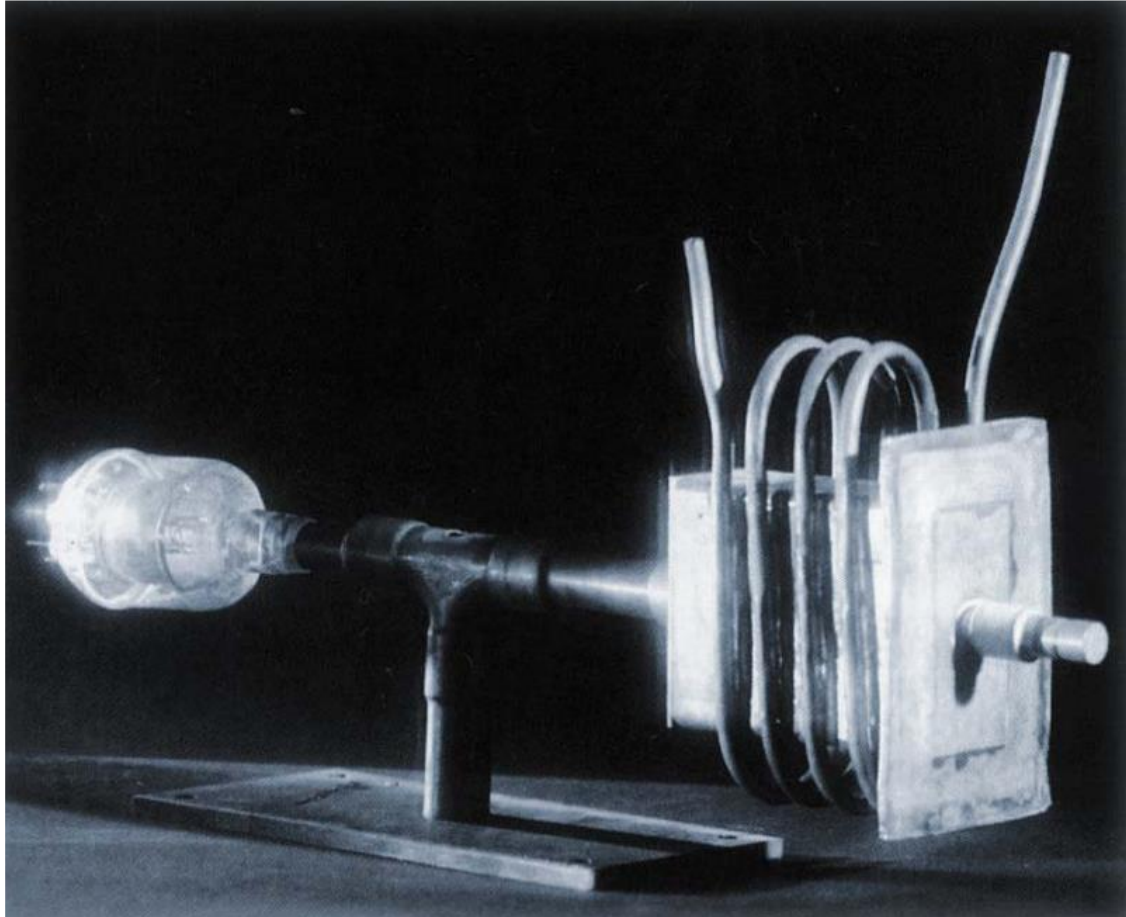
BOMBA IÔNICA MAGNÉTICA

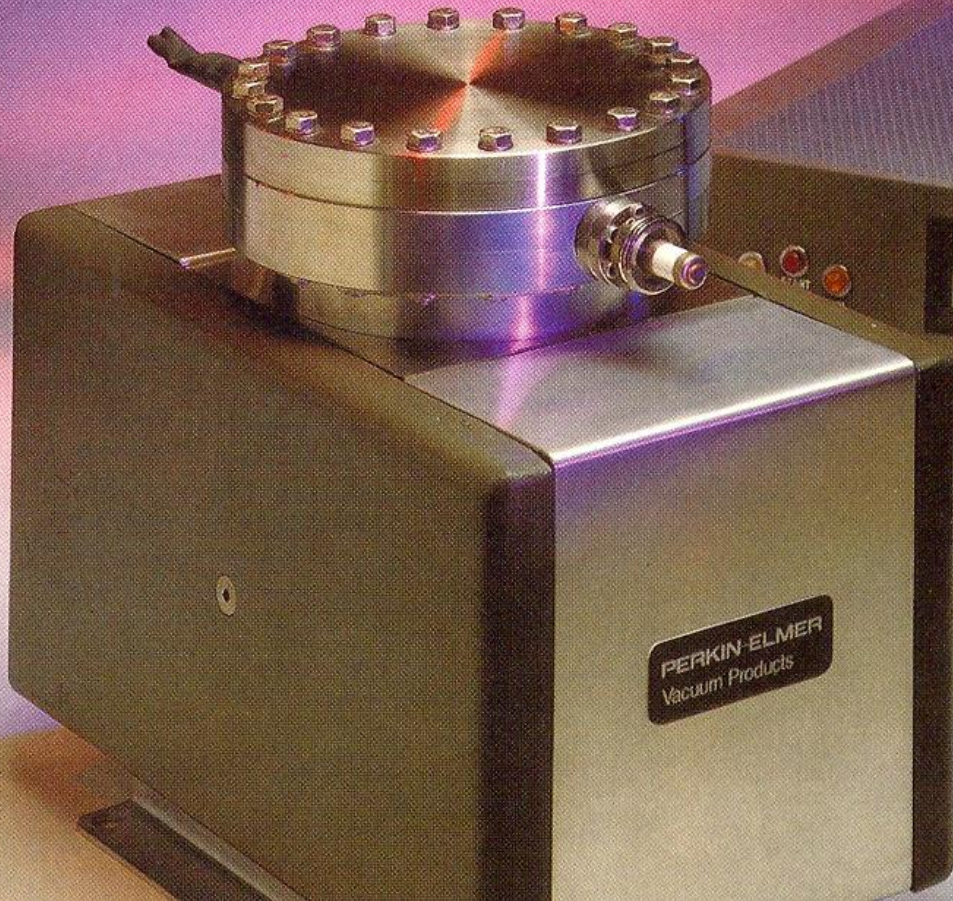




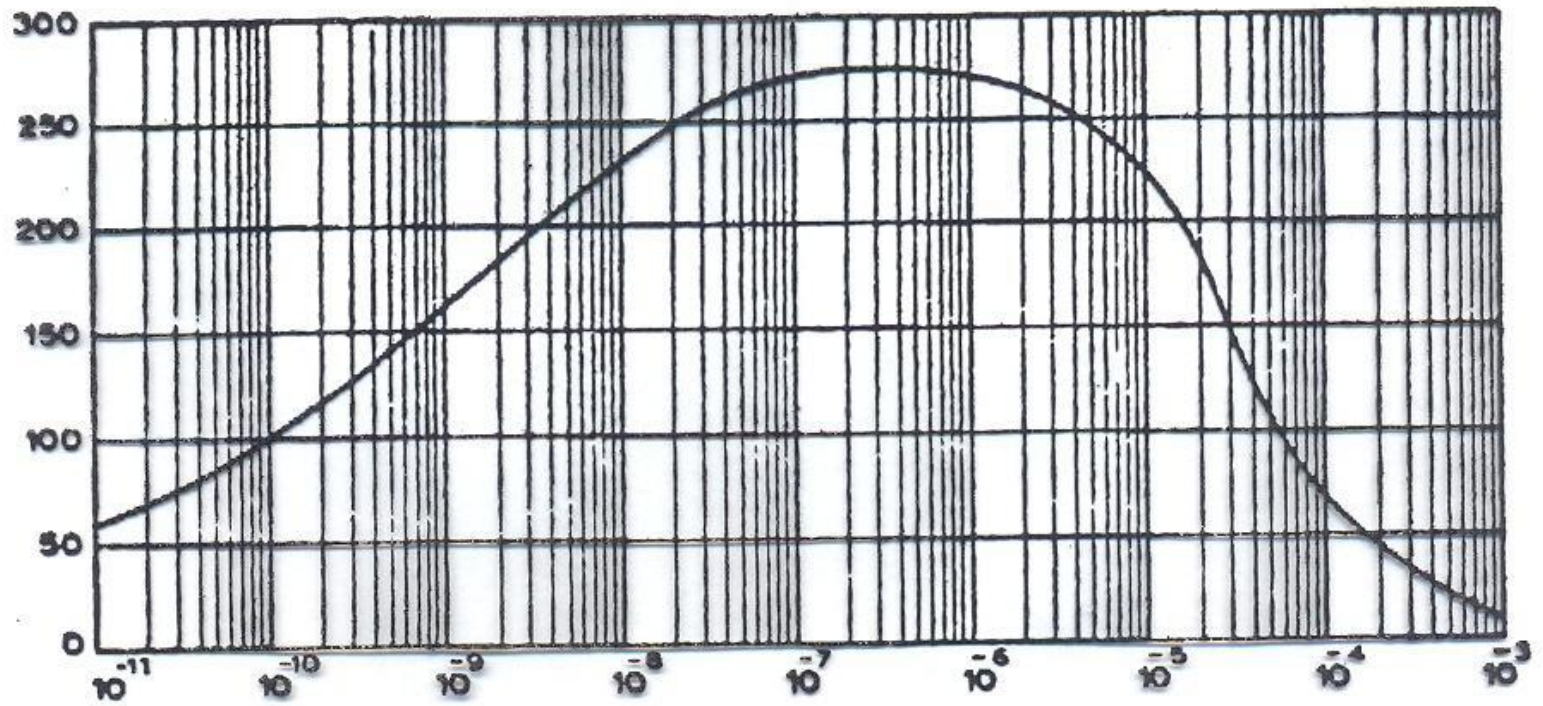


PRIMEIRA BOMBA IÔNICA VARIAN

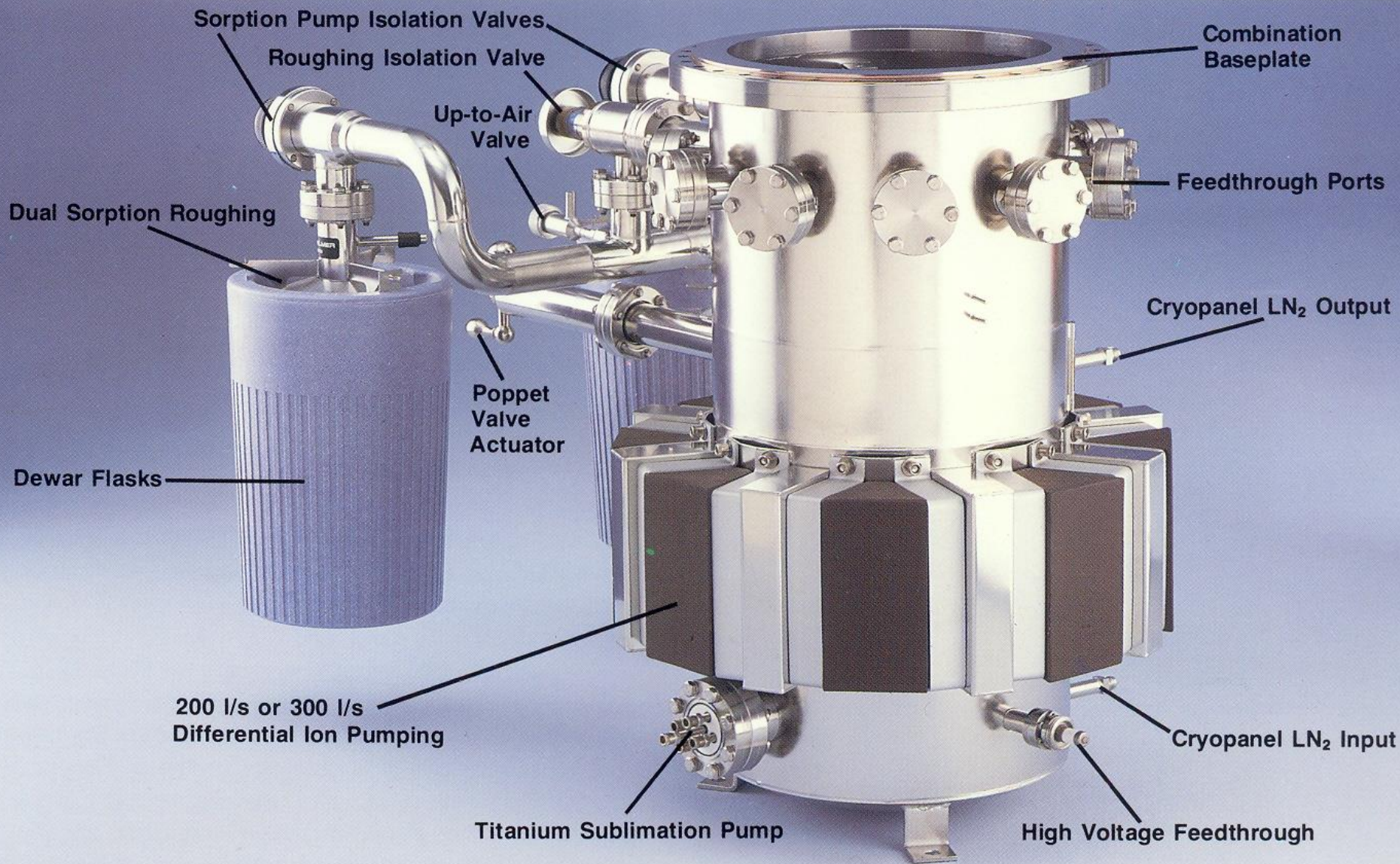




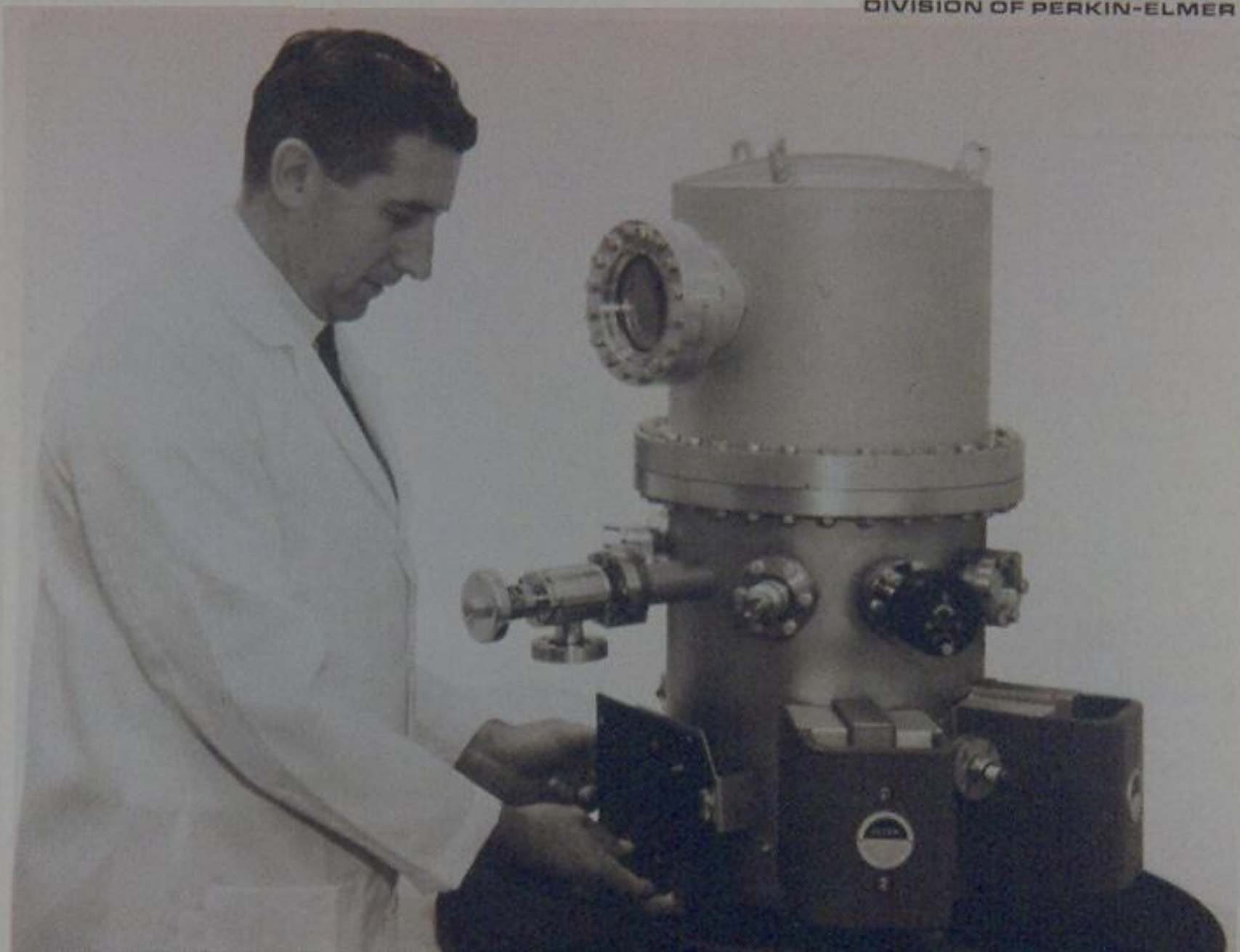
Velocidade (l/s)



Pressão (Torr)

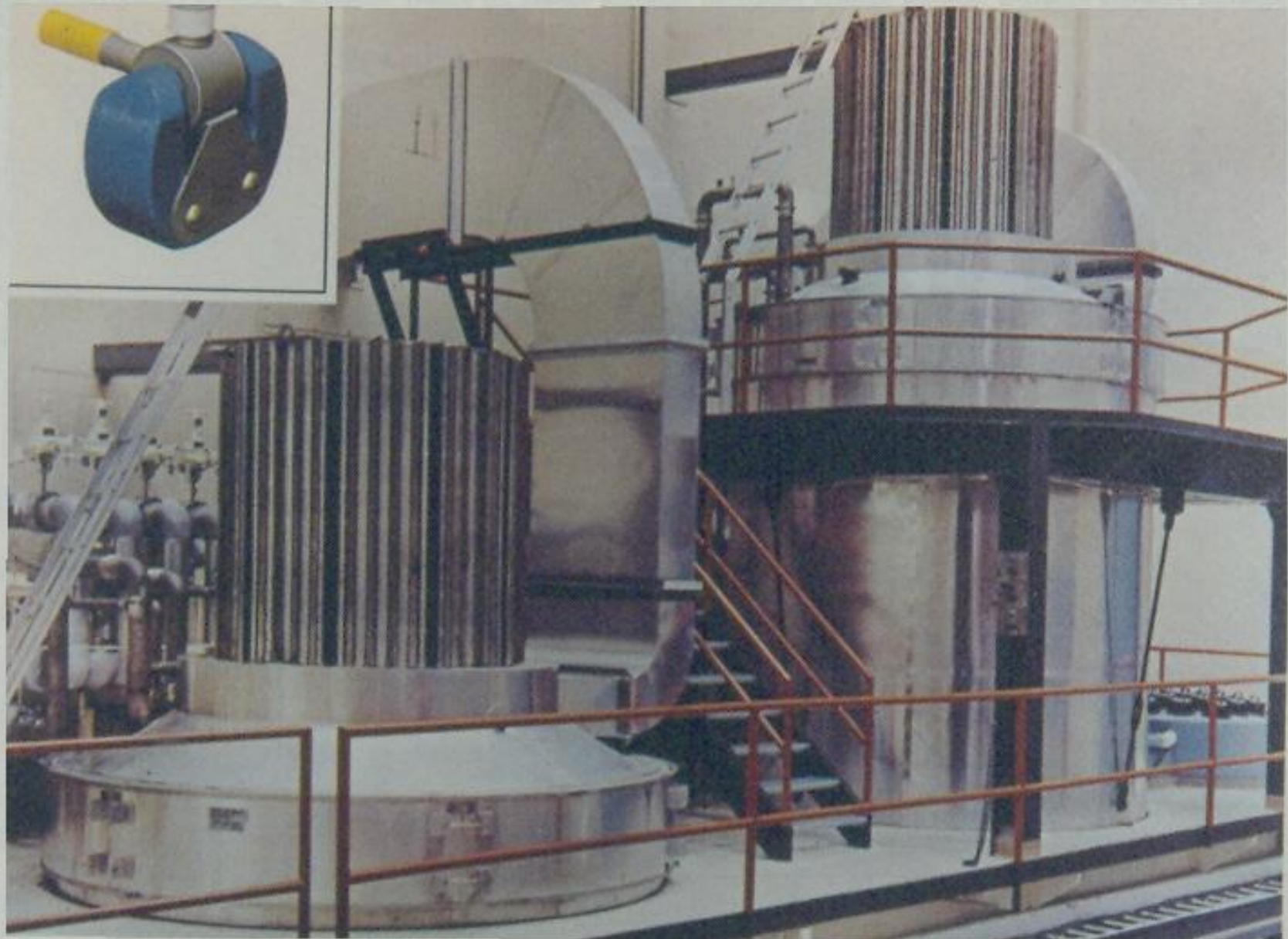


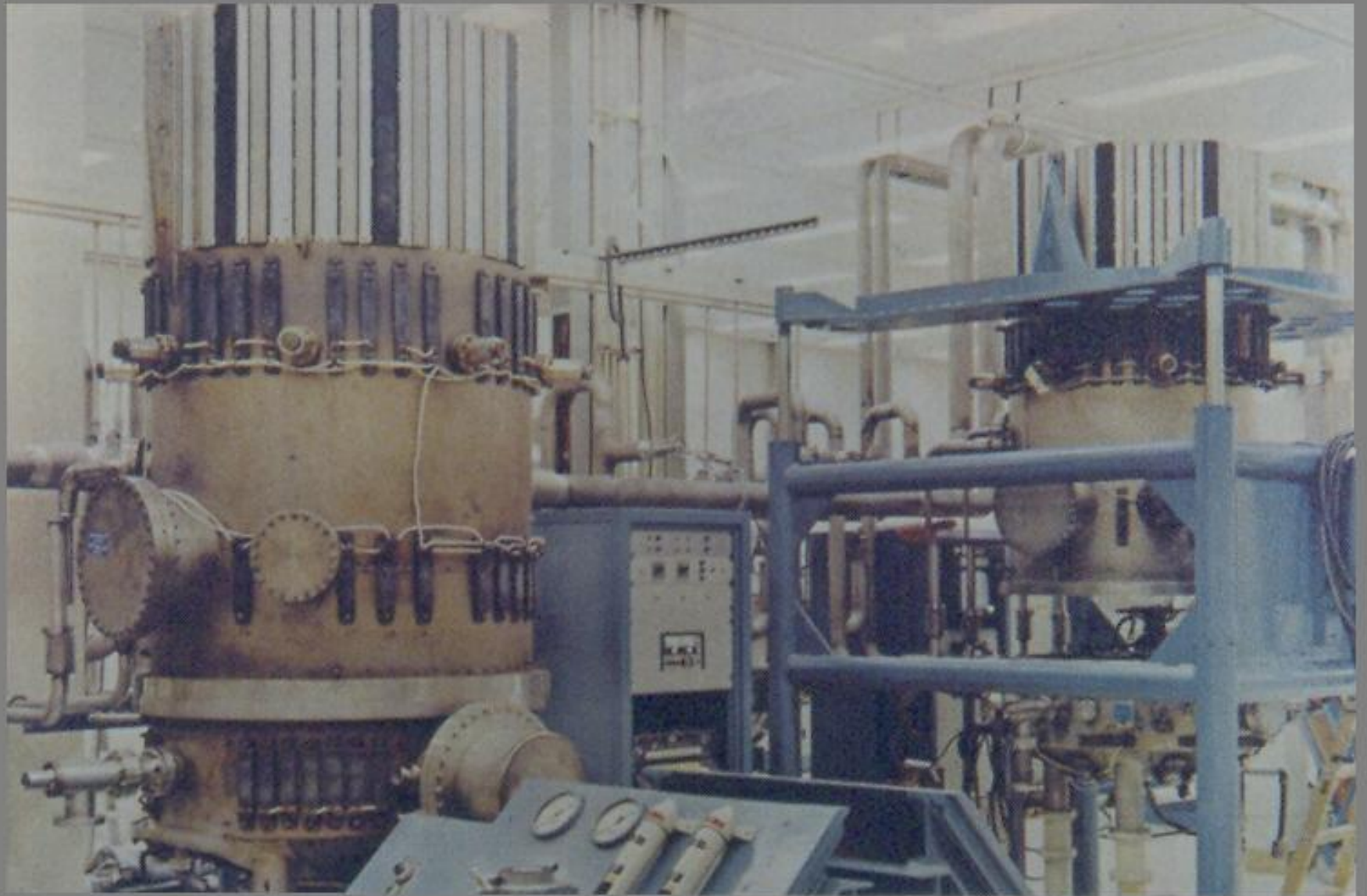
DIVISION OF PERKIN-ELMER



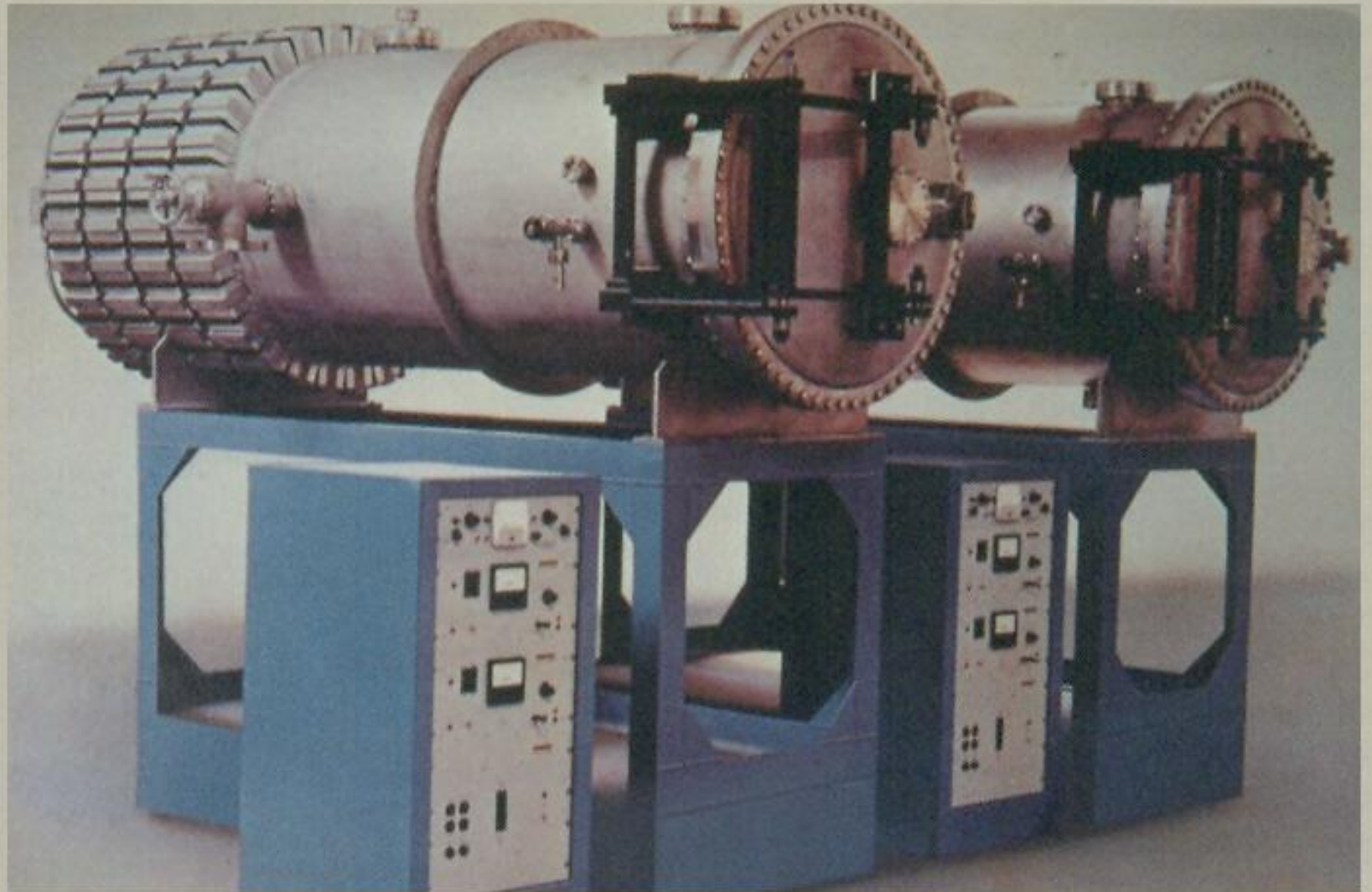


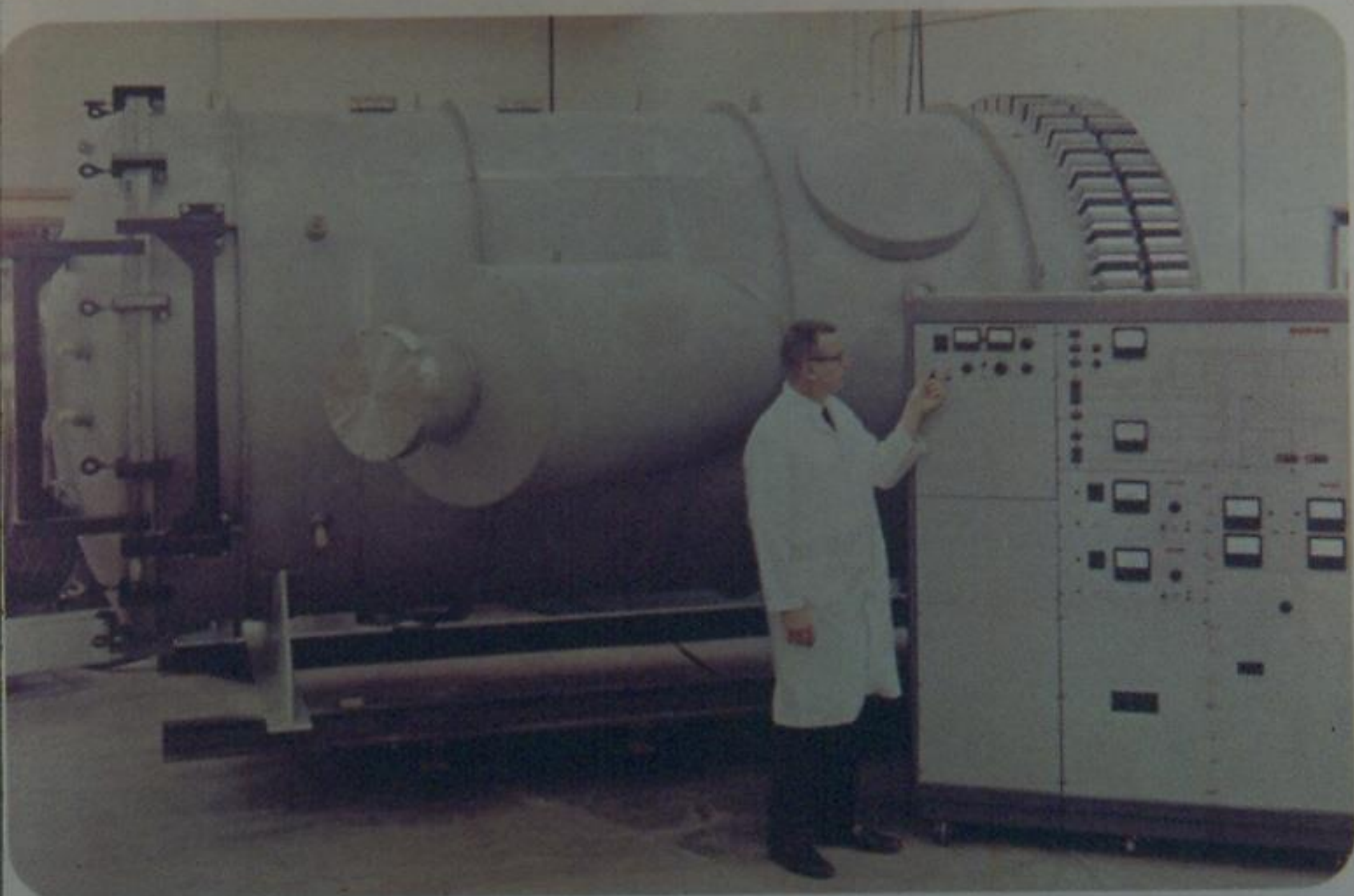
3.





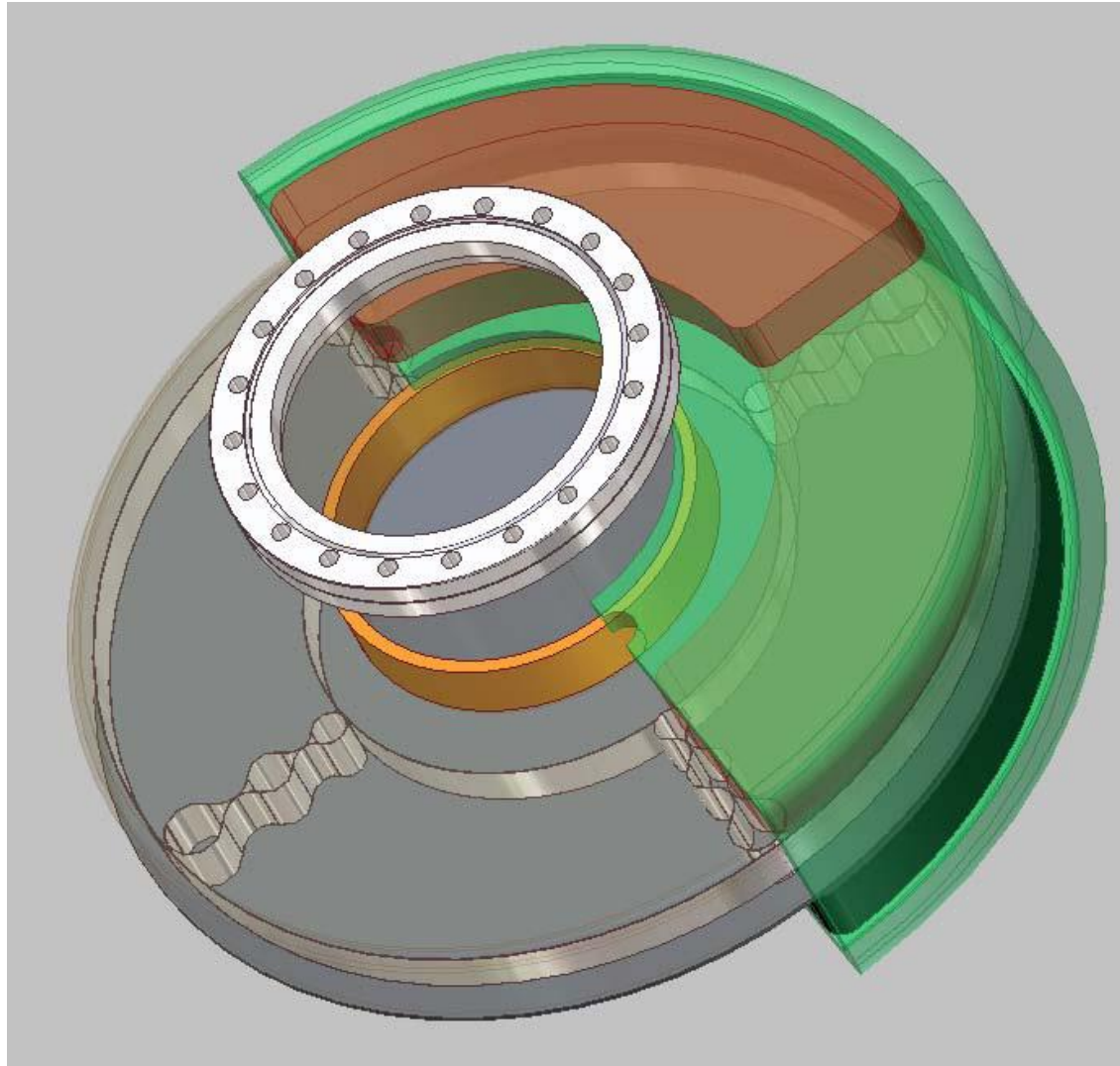
3' dia. x 6' chamber for material evaluation and bearing testing; 10^{-12} torr ultimate pressure.



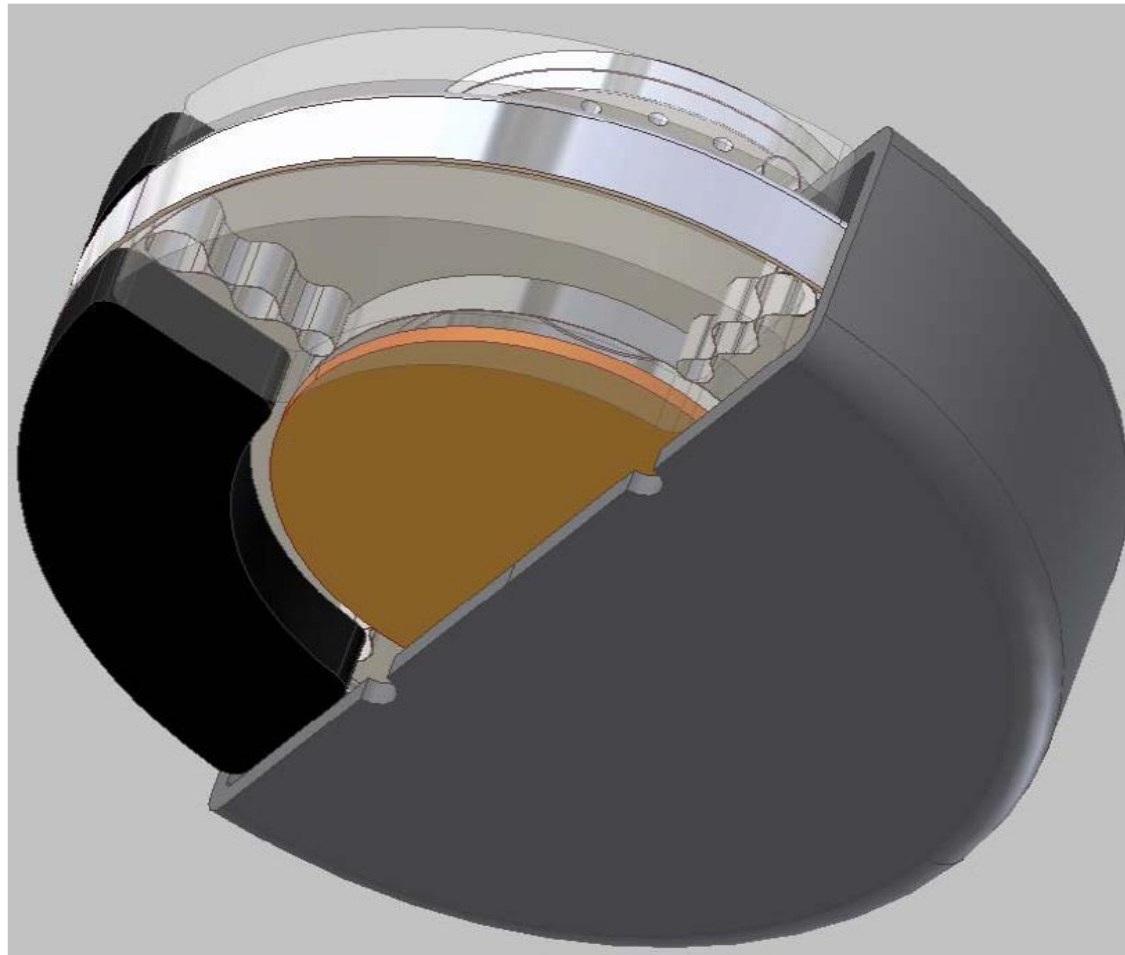


6½' dia. x 15' chamber for testing components and sub-assemblies of satellites; ultimate pressure 5×10^{-10} torr.

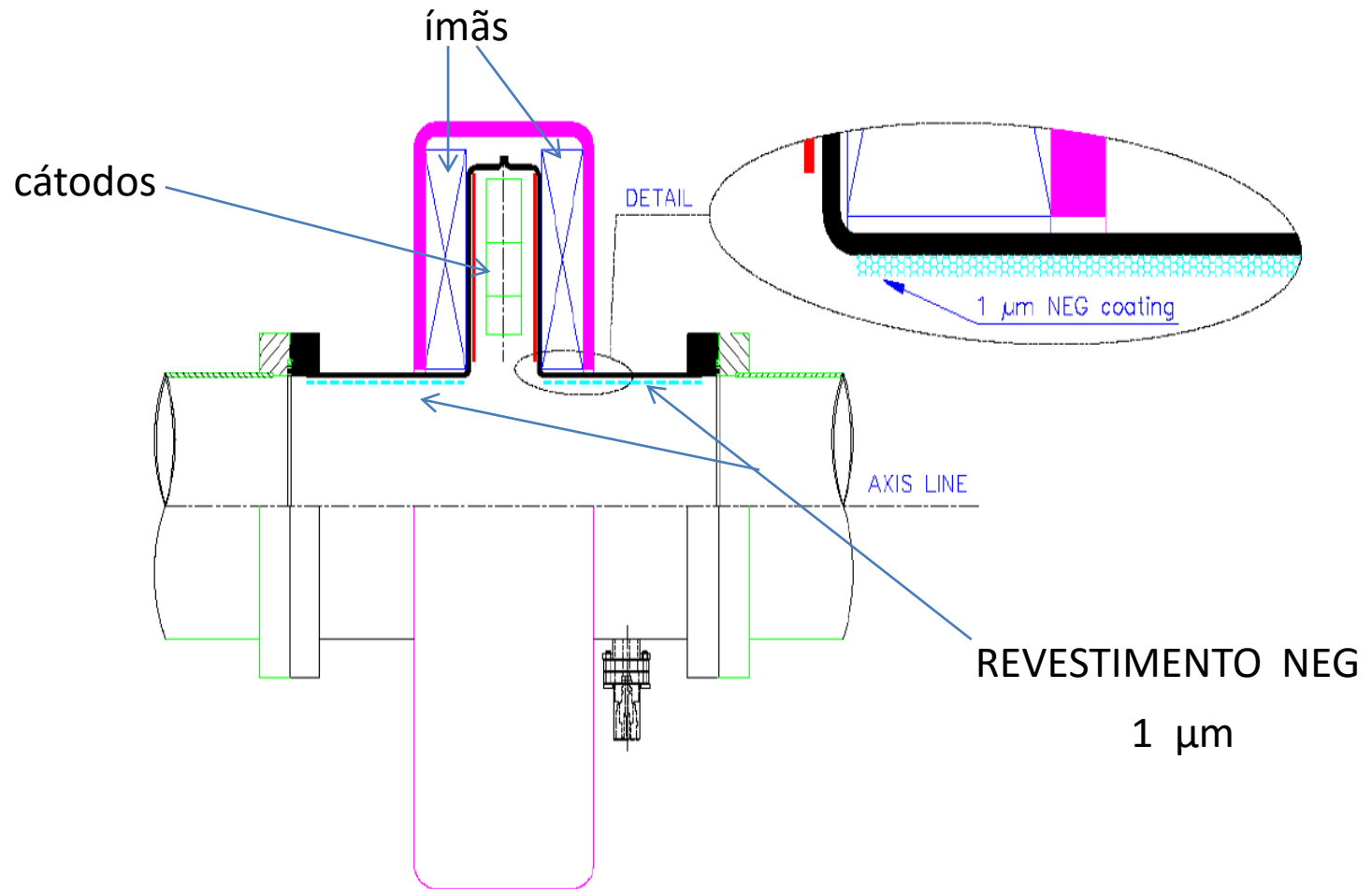
BOMBA IÔNICA RIP (ROUND ION PUMP)



BOMBA IÔNICA RIP - VISTA INFERIOR



BOMBA IÔNICA RIP + NEG



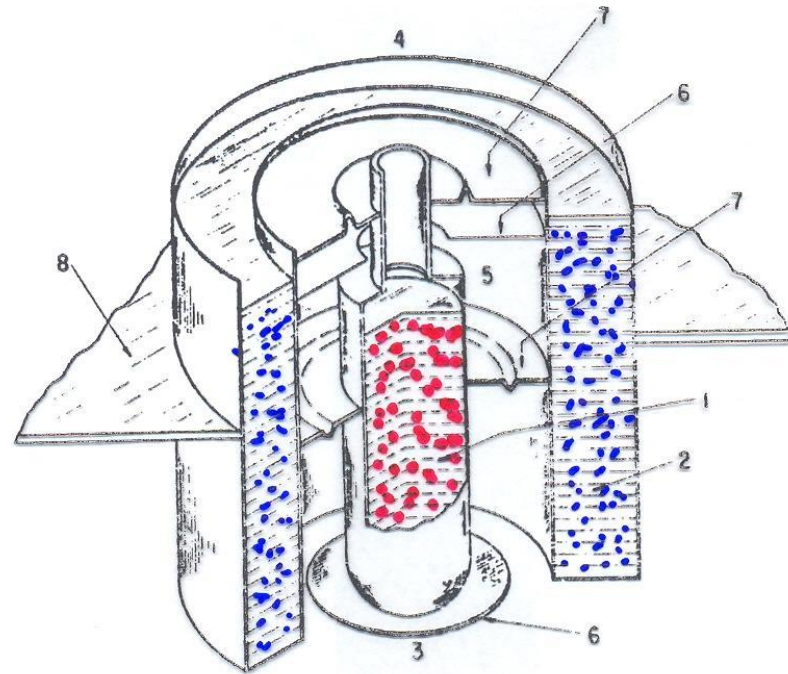
BOMBA IÔNICA RIP

+ NEG (Zr + V + Ti 1 μ m)

+ Paládio (150 nm)



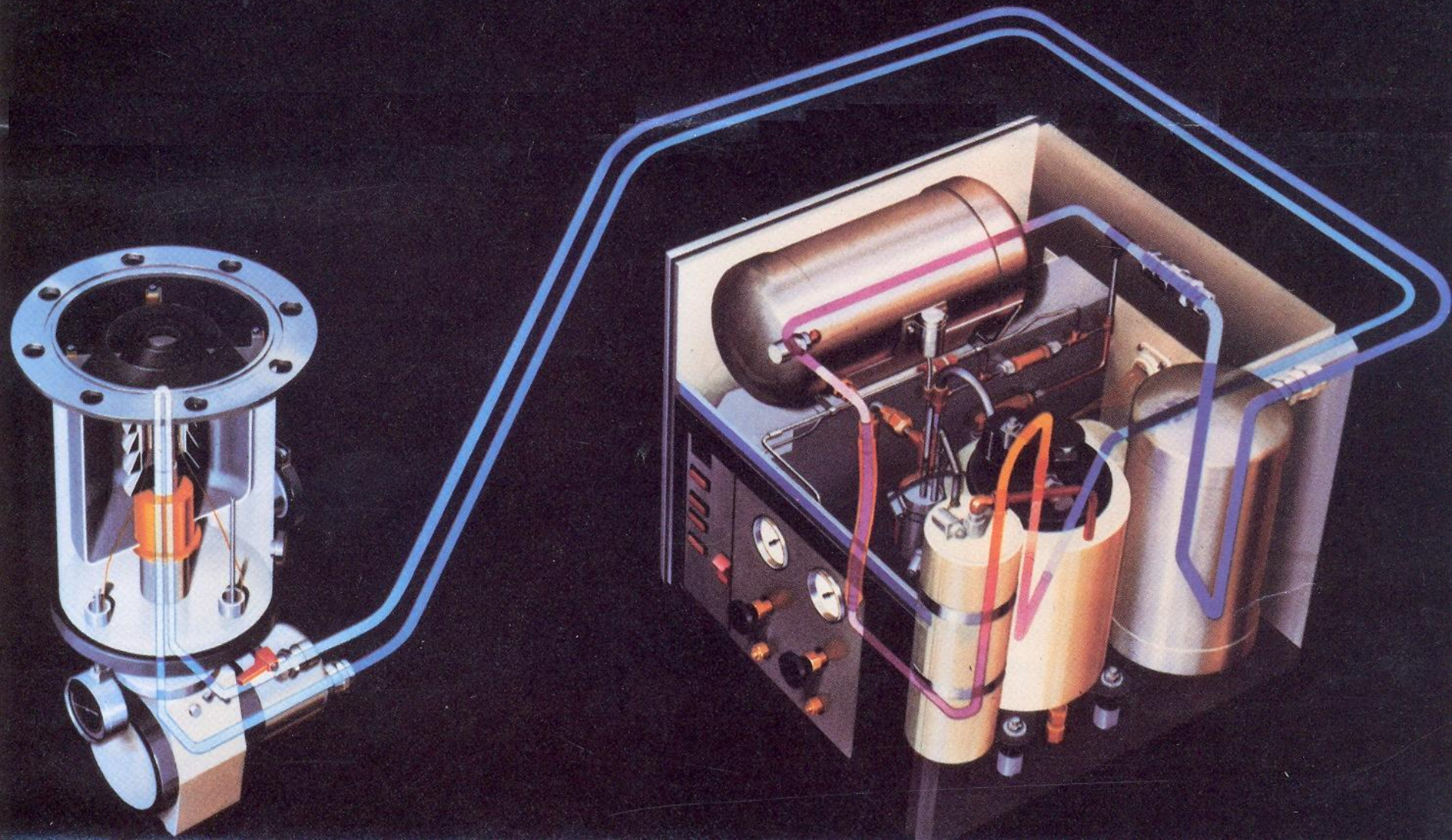
BOMBA CRIOGÊNICA



Desenho esquemático de uma bomba criogênica.

- 1 - Hélio líquido •
- 2 - Nitrogênio líquido •
- 3 - Região de ultra-alto vácuo
- 4 - Pressão atmosférica
- 5 - Região de vácuo (isolada)
- 6 - Refletor de calor
- 7 - Separador
- 8 - Parede da câmara (onde está instalada a bomba)

BOMBA CRIOGENICA

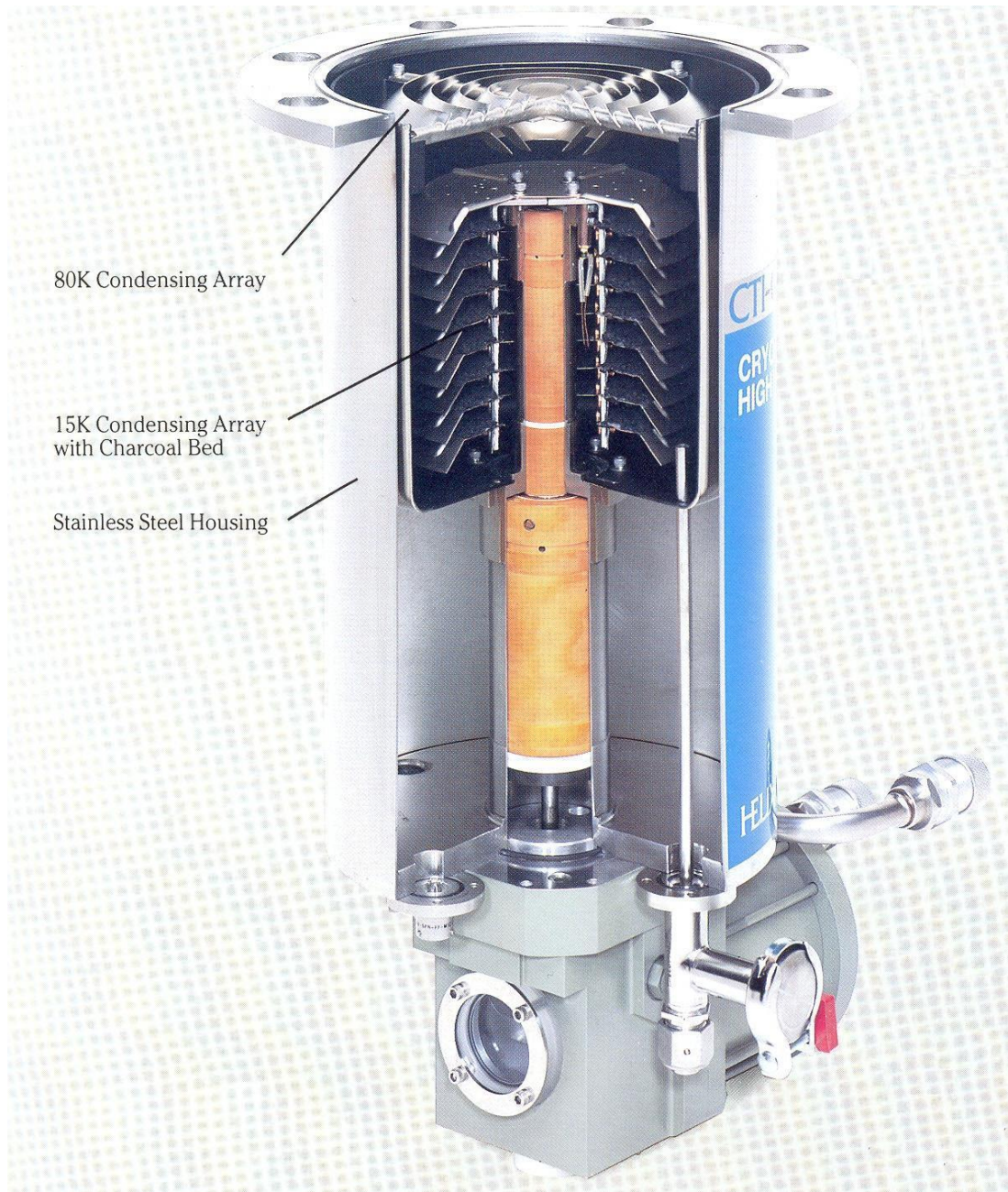




80K Condensing Array

15K Condensing Array
with Charcoal Bed

Stainless Steel Housing



FIRST STAGE CHEVRON CRYOARRAY.

- WATER VAPOR ●
- NITROGEN ●
- OXYGEN ●
- ARGON ●
- HYDROGEN ●
- HELIUM ●
- NEON ●

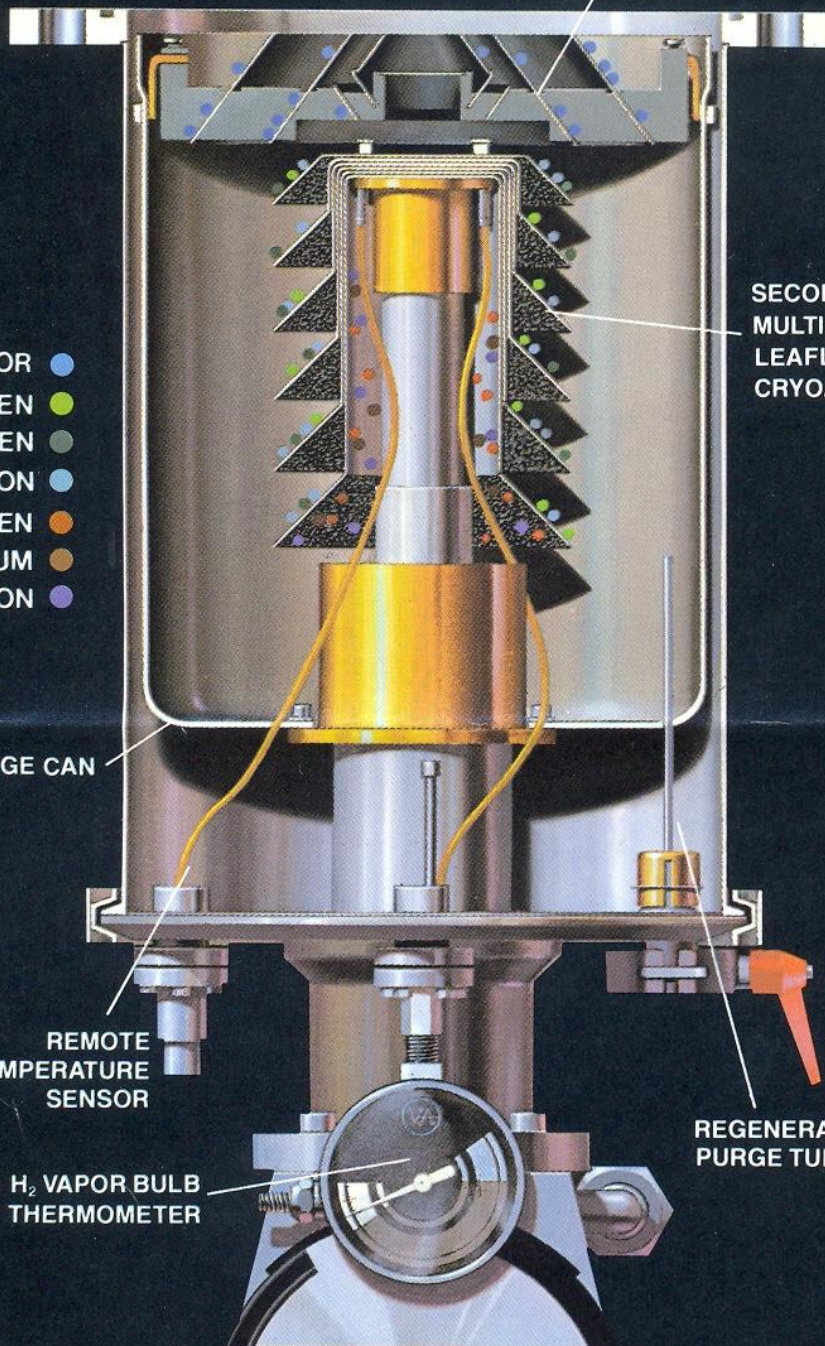
SECOND STAGE
MULTILAYERED
LEAFLET
CRYOARRAY.

FIRST STAGE CAN

REMOTE
TEMPERATURE
SENSOR

H₂ VAPOR BULB
THERMOMETER

REGENERATION.
PURGE TUBE





	Varian VK-12C	Edwards CRP8
Ø da flange	8"	8"
água	4.100 l/s	4.200 l/s
ar	1.050 l/s	1.150 l/s
argônio	950 l/s	1.050 l/s
hidrogênio	1.150 l/s	1.400 l/s
nitrogênio	1.050 l/s	-
hélio	-	750 l/s
potência	1,8 kW	1,8 kW



